STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
D. H. BLOOD, Director

DIVISION OF MINES
FERRY BUILDING, SAN FRANCISCO
WALTER W. BRADLEY State Mineralogist

San Francisco] BULLETIN No. 105 [August, 1931

CALIFORNIA MINERAL PRODUCTION

AND

DIRECTORY OF MINERAL PRODUCERS

FOR 1930

By
HENRY H. SYMONS

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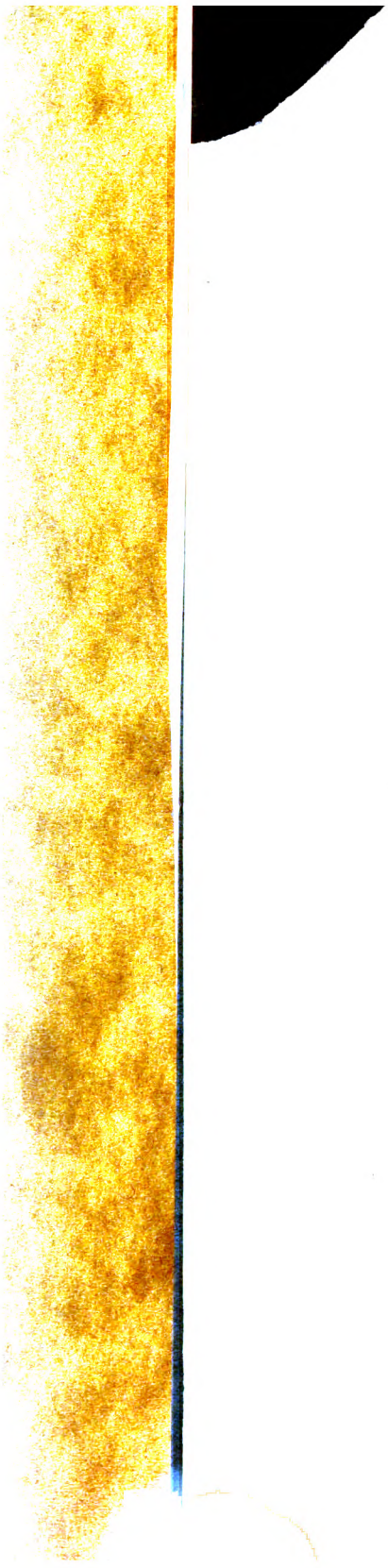

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LETTER OF TRANSMITTAL

August, 1931.

To His Excellency, THE HONORABLE JAMES ROLPH, JR.,
Governor of the State of California.

SIR: I have the honor to herewith transmit Bulletin No. 105 of the State Division of Mines, being the annual report of the statistics of the mineral production of California.

The remarkable variety, total valuation, and wide distribution of many of our minerals revealed herein show California's importance as a producer of commercial minerals among the states of the Union.

Respectfully submitted.

WALTER W. BRADLEY,
State Mineralogist.

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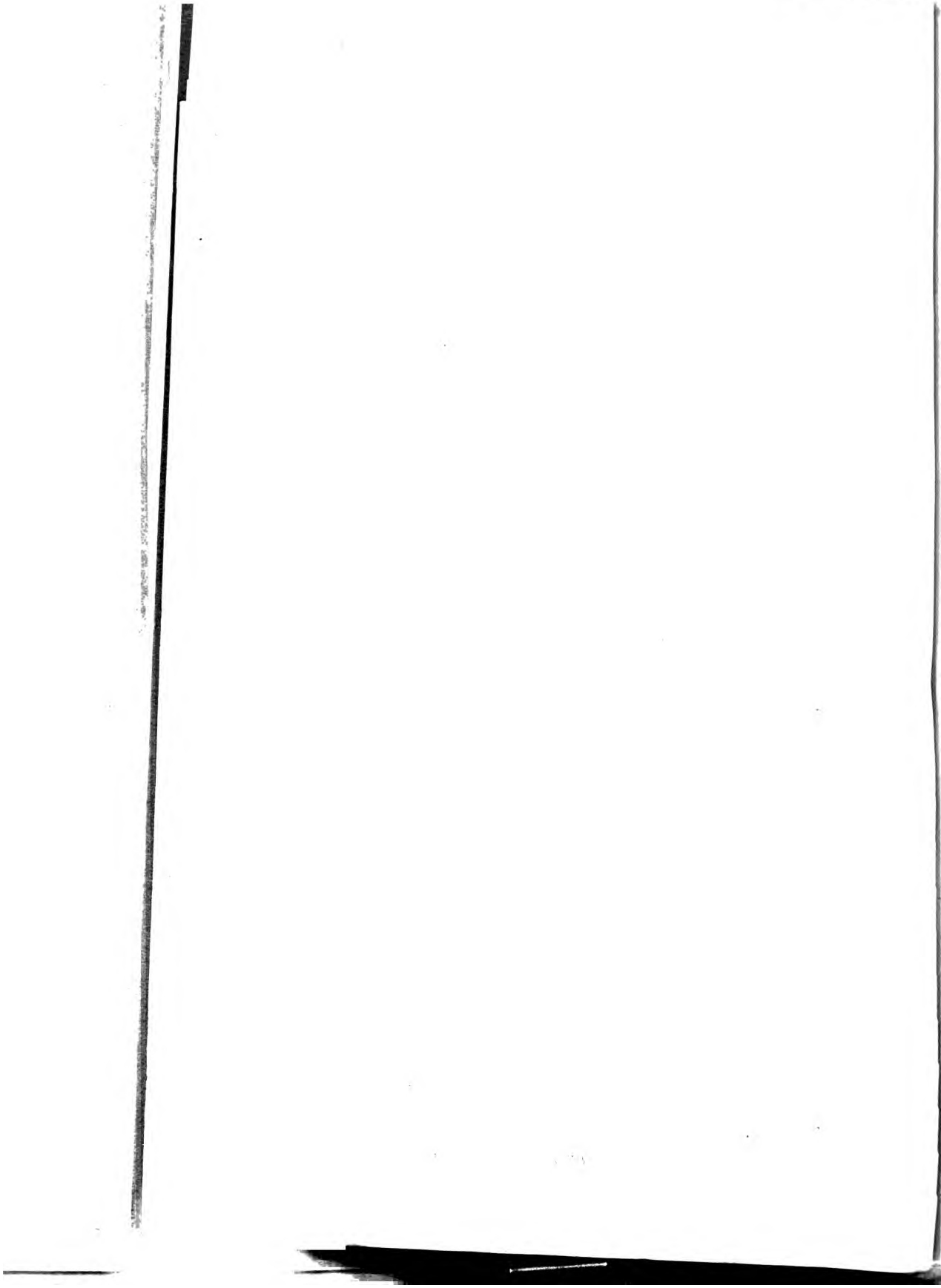

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INTRODUCTION

It is the endeavor of the staff of the State Division of Mines (formerly State Mining Bureau), in these annual reports of the mineral industries of California, to so compile the statistics of production that they will be of actual use to producers and to those interested in the utilization of the mineral products of our State, while at the same time keeping the individual's data confidential. In addition to the mere figures of output, we have included descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrences.

The compilation of accurate and dependable figures is an extremely difficult undertaking, and the State Mineralogist takes the opportunity of here expressing his appreciation of the cooperation of the producers in making this work possible. A fuller appreciation of the value of early responses to the requests sent out in January will result in earlier completion of the manuscript. Statistics lose much of their value if their publication is unnecessarily delayed.

Some of the data relative to properties and uses of many of the minerals herein described are repeated from preceding reports, as it is intended that this annual statistical bulletin shall be somewhat of a compendium of information on California's commercial minerals and their utilization.

WALTER W. BRADLEY,
State Mineralogist.

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MINERAL INDUSTRY, CALIFORNIA, 1930

DATA COMPILED FROM DIRECT RETURNS FROM PRODUCERS IN ANSWER TO INQUIRIES SENT OUT BY THE CALIFORNIA STATE DIVISION OF MINES, FERRY BUILDING, SAN FRANCISCO, CALIFORNIA

CHAPTER ONE

The total value of the mineral output of California for the year 1930 was $365,604,695, being a decrease of $66,643,533 from the 1929 total of $432,248,228. There were fifty-one different mineral substances, exclusive of a segregation of the various stones grouped under gems; and all but one of the fifty-eight counties of the State contributed to the list.

As revealed by the data following, the salient features of 1930 compared with the previous years were: A material decline in the amount and value of the petroleum output, with notable decreases in amounts and values of cement, natural gas, copper, miscellaneous stone, salt, brick and hollow building tile, and pottery clay. Increases were registered by gold, mineral water, borax, potash, quicksilver, lime, and lead. Petroleum showed a decrease in value of $49,667,817. There was a decrease from 292,534,221 barrels to 227,328,988. The 1929 output of crude oil was the largest in the history of the State and the decrease was due to curtailment in production rather than decreased prices. The natural gas output decreased from 400,129,201 M cu. ft. valued at $29,067,546 to 315,513,952 M cu. ft. worth $24,559,840.

Of the metals, the gold production increased in value from a total of $8,526,703 to $9,451,162; quicksilver from 10,152 flasks worth $1,195,705 to 11,374 flasks worth $1,255,257; and lead from 1,428,777 lbs. worth $90,014 to 3,524,796 lbs. worth $176,241. Decreases were shown in copper from 33,809,258 lbs. worth $5,941,799 to 26,534,752 lbs. worth $3,449,522 and silver from 1,176,895 fine oz. worth $627,285 to 1,622,803 fine oz. worth $624,779. The increase in gold was due to increased activity from the lode mines, the placer mines output showing a decrease charged entirely to the dredges. The decrease in copper was due to the declining price of the metal during the year.

Of the structural materials, lime was the only important item to show an increase which was from 42,834 tons worth $417,101 to 47,662 tons worth $452,084. Cement decreased from 12,794,729 bbls. worth $21,038,565 to 9,831,938 bbls. worth $14,575,731, brick and hollow building tile from a value of $5,607,410 to $4,205,460 and miscellaneous stone from $17,840,159 to $16,430,027. Of the industrial minerals, mineral water showed an increase from 27,032,083 gals. worth $2,040,-

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615 to 37,354,111 gals. worth $2,870,663; pumice and volcanic ash and fuller's earth also showed small increases in their total values, with all materials, other than these, in the group showing decreases and a decrease in total value. Of the saline group, borax showed increases from 144,687 tons worth $3,312,085 to 209,869 tons worth $3,686,817; potash also showed a marked increase, but not enough to offset the decrease in salt and other minerals of this group. All groups showed a decrease in their totals of value.

The figures of the State Division of Mines are made up from reports received direct from the producers of the various minerals. Care is exercised in avoiding duplication, and any error is likely to be on the side of under- rather than over-estimation.

California yields, commercially, a greater number and variety of mineral products than any State in the United States, and probably more than any other equal area elsewhere on the earth. The total annual value of her output has been surpassed by not more than four or five others, and those usually the great coal states of east of the Mississippi. More recently California has been placed second to Pennsylvania, the leader. California was for many years the sole domestic source of borax, chromite and magnesite, and in which we still lead. We lead all other states in the production of gold, quicksilver, and platinum; and have alternated in the lead with Colorado in tungsten, and with Oklahoma in petroleum.

The mineral industries, not only in California but throughout the country, have reached quite a different phase from that of the old gold-rush days more than fifty years ago. A broader and more intimate status has been attained, touching practically every avenue of domestic and commercial endeavor. As quoted in a former report[1] of the freight handled by the railroads of the country, the products of the mines represent 51.33 per cent. While gold, in which California still leads the United States, is still important, other metals and even non-metals have superseded it in annual value. The greatest commercial developments proportionately in California in recent years have taken place among the industrial and structural minerals, not to mention petroleum, which leads all others in value. This introduces a new factor which requires study and attention—that of marketing. The gold miner could, and still does, take his metal to the mint and receive its equivalent in the 'coin of the realm'; and he knows from day to day and year to year, without variation, just how much each ounce of gold will bring in that coin, though its equivalent in other commodities varies according to economic conditions. Marketing and competition, however, are vital factors in the industrial and structural groups.

[1] Cal. State Min. Bur., Bulletin 96, p. 12, 1925.

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By Substances.

The following table shows the comparative yield of mineral substances of California for 1929 and 1930, as compiled from the returns received at the State Division of Mines, San Francisco, in answer to inquiry sent to producers:

Substance	1929		1930		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Barytes	26,796 tons	$168,829	19,783 tons	$133,107	$35,722—
Bituminous rock	3,320 tons	14,360	8,525 tons	36,075	21,715+
Borates	144,678 tons	3,312,085	209,869 tons	3,686,817	374,732+
Brick and hollow building Tile		5,607,410		4,205,460	1,401,950—
Cement	12,794,729 bbls.	21,038,565	9,831,938 bbls.	14,575,731	6,462,834—
Chromite	327 tons	5,025	80 tons	1,905	3,120—
Clay (pottery)	839,949 tons	1,127,517	938,586 tons	795,517	332,000—
Coal	450 tons	2,476	10,885 tons	59,858	57,382+
Copper	33,809,258 lbs.	5,941,799	26,534,752 lbs.	3,449,522	2,492,277—
Dolomite	58,644 tons	156,928	35,721 tons	106,813	50,115—
Feldspar	13,377 tons	78,404	5,014 tons	35,654	42,750—
Fuller's earth	15,541 tons	170,563	12,522 tons	177,964	7,401+
Gems		26,850		3,540	23,310—
Gold		8,526,703		9,451,162	924,459+
Granite		1,169,271		855,477	313,794—
Gypsum	104,844 tons	396,951	116,865 tons	243,507	153,444—
Lead	1,428,777 lbs.	90,014	3,524,796 lbs.	176,241	86,227+
Lime	42,834 tons	417,101	47,662 tons	452,084	34,983+
Limestone	162,315 tons	557,617	169,477 tons	508,751	48,866—
Magnesite	47,769 tons	488,014	38,681 tons	388,472	99,542—
Marble[a]		93,661		82,194	11,467—
Mineral paint	467 tons	2,820	*	*	* —
Mineral water	27,032,083 gals.	2,040,615	37,354,111 gals.	2,870,663	830,048+
Natural gas	400,129,201 M.cu.ft.	29,067,546	315,513,952 M.cu.ft.	24,559,840	4,507,706—
Petroleum	292,534,221 bbls.	321,366,863	227,328,988 bbls.	271,699,046	49,667,817—
Platinum	212 fine oz.	14,416	217 fine oz.	11,700	2,716—
Pumice and volcanic ash	10,449 tons	76,123	12,974 tons	128,847	52,724+
Pyrite	79,169 tons	363,717	39,954 tons	194,228	169,489—
Quicksilver	10,152 flasks	1,195,705	11,374 flasks	1,255,257	59,552+
Salt	392,039 tons	2,665,436	347,945 tons	1,167,487	1,497,949—
Sandstone		49,881		56,404	6,523+
Silica (sand and quartz)	18,686 tons	79,210	17,802 tons	71,380	7,830—
Silver	1,176,895 fine oz.	627,285	1,622,803 fine oz.	624,779	2,506—
Soapstone and talc	18,676 tons	193,493	15,861 tons	154,258	39,235—
Soda	90,646 tons	1,838,657	90,122 tons	1,627,344	211,313—
Stone, miscellaneous[b]		17,840,159		16,430,027	1,410,132—
Tungsten	150 tons	106,480	*	*	*
Unapportioned		[c]5,329,679		[d]5,327,584	2,095—
Total value		$432,248,228		$365,604,695	
Net decrease					$66,643,533

* Included under Unapportioned.

[a] Includes onyx and travertine.

[b] Includes macadam, ballast, rubble, riprap, sand, gravel.

[c] Includes asbestos, bromine, calcium chloride, diatomaceous earth, magnesium salts, manganese, mica (sericite), potash, slate, sillimanite-andalusite-cyanite group, tube-mill pebbles, sulphur.

[d] Includes asbestos, bromine, calcium chloride, diatomaceous earth, iron ore, magnesium salts, manganese ore, mineral paint, potash, slate, sillimanite-andalusite-cyanite group, tube-mill pebbles, sulphur, tungsten and paving blocks.

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By Counties.

The following table shows the comparative value of the mineral production of the various counties in the State for the years 1929 and 1930:

County	1929	1930
Alameda	$3,626,723	$2,529,337
Alpine	33,013	2,500
Amador	2,498,217	2,424,687
Butte	584,319	539,666
Calaveras	2,522,259	2,083,956
Colusa	42,570	50,140
Contra Costa	1,827,956	1,643,286
Del Norte	84,263	176,030
El Dorado	367,500	493,243
Fresno	2,413,495	2,324,473
Glenn	81,516	61,179
Humboldt	293,678	270,633
Imperial	509,832	368,023
Inyo	2,296,210	2,260,766
Kern	38,809,239	42,987,977
Kings	4,259,833	13,106,843
Lake	387,700	268,364
Lassen	88,698	18,094
Los Angeles	243,568,275	171,616,329
Madera	1,027,410	675,782
Marin	470,002	405,541
Mariposa	244,017	143,465
Mendocino	59,000	123,062
Merced	1,110,498	801,900
Modoc	30,996	16,250
Mono	212,831	148,984
Monterey	354,858	452,974
Napa	649,822	532,983
Nevada	1,980,028	2,320,233
Orange	28,491,495	26,335,290
Placer	266,347	323,717
Plumas	5,137,968	3,219,900
Riverside	5,401,860	3,220,636
Sacramento	2,247,302	2,303,108
San Benito	1,908,462	1,389,490
San Bernardino	11,210,652	10,657,301
San Diego	1,447,287	1,303,047
San Francisco	75,245	23,428
San Joaquin	789,891	724,862
San Luis Obispo	191,084	248,115
San Mateo	3,672,779	2,499,937
Santa Barbara	16,407,136	24,368,374
Santa Clara	963,478	884,329
Santa Cruz	3,327,633	2,361,954
Shasta	1,751,196	1,111,146
Sierra	390,402	606,585
Siskiyou	229,789	235,401
Solano	66,421	46,638
Sonoma	351,383	330,399
Stanislaus	388,235	331,688
Sutter		
Tehama	14,480	226,400
Trinity	525,874	437,333
Tulare	296,881	253,144
Tuolumne	371,520	318,322
Ventura	34,043,899	31,952,052
Yolo	14,400	27,000
Yuba	1,830,371	1,018,399
Totals	$432,248,228	$365,604,695

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Total Mineral Production of California, by Years, Since 1887.

The following tabulation gives the total value of mineral production of California by years since 1887, in which year compilation of such data by the State Mining Bureau (now Division of Mines) began. At the side of these figures have been placed the values of the most important metal and non-metal items—gold and petroleum.

In the same period copper made an important growth beginning with 1897 following the entry of the Shasta County mines, and more recently Plumas County. Cement increased rapidly from 1902, while crushed rock, sand and gravel as a group parallels the cement increase. Quicksilver has been up and down. Mineral water and salt have always been important items, but the values fluctuate. Borax has increased materially since 1896. War-time increases, 1915–1918, were shown by chromite, copper, lead, magnesite, manganese, silver, tungsten and zinc. Most of these have since declined, though silver, structural materials and copper increased in 1920–1924, also lead and magnesite in 1923; lead and zinc in 1925; zinc in 1926, with silver declining; an increase in quicksilver in 1927–1928, with declines in other metals and by petroleum. Natural gas has shown a steady increase since 1907, and in 1929 its value was second only to petroleum.

Total Mineral Production of California, by Years, Since 1887

Year	Total value of all minerals	Gold, value	Petroleum, value
1887	$19,785,868	$13,588,614	$1,357,144
1888	19,469,320	12,750,000	1,380,666
1889	16,681,731	11,212,913	368,048
1890	18,039,666	12,309,793	384,200
1891	18,872,413	12,728,869	401,264
1892	18,300,168	12,571,900	561,333
1893	18,811,261	12,422,811	608,092
1894	20,203,294	13,923,281	1,064,521
1895	22,844,663	15,334,317	1,000,235
1896	24,291,398	17,181,562	1,180,793
1897	25,142,441	15,871,401	1,918,269
1898	27,289,079	15,906,478	2,376,420
1899	29,313,460	15,336,031	2,660,793
1900	32,622,945	15,863,355	4,152,928
1901	34,355,981	16,989,044	2,961,102
1902	35,069,105	16,910,320	4,692,189
1903	37,759,040	16,471,264	7,313,271
1904	43,778,348	19,109,600	8,317,809
1905	43,069,227	19,197,043	9,007,820
1906	46,776,085	18,732,452	9,238,020
1907	55,697,949	16,727,928	16,783,943
1908	66,363,198	18,761,559	26,566,181
1909	82,972,209	20,237,870	32,398,187
1910	88,419,079	19,715,440	37,683,542
1911	87,497,879	19,738,908	40,552,088
1912	88,972,385	19,713,478	41,868,344
1913	98,644,639	20,406,958	48,578,014
1914	93,314,773	20,653,496	47,487,109
1915	96,663,369	22,442,296	43,503,837
1916	127,901,610	21,410,741	57,421,334
1917	161,202,962	20,087,504	86,976,209
1918	199,753,837	16,529,162	127,459,221
1919	195,830,002	16,695,955	142,610,563
1920	242,099,667	14,311,043	178,394,937
1921	268,157,472	15,704,822	203,138,225
1922	245,183,826	14,670,346	173,381,265
1923	344,024,678	13,379,013	242,731,309
1924	374,620,789	13,150,175	274,652,874
1925	434,519,660	13,065,330	330,603,829
1926	450,330,856	11,923,481	345,546,677
1927	366,781,394	11,671,018	260,735,498
1928	332,224,233	10,785,315	229,998,680
1929	432,248,228	8,526,703	321,366,863
1930	365,604,695	9,451,162	271,699,046
Totals	**$5,852,104,882**	**$694,169,751**	**$3,643,094,692**

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CHAPTER TWO

FUELS

Among the most important mineral products of California are its fuels. This subdivision includes coal, natural gas, and petroleum, the combined values of which made up practically 81 per cent of the state's entire mineral output for the year 1929.

There are deposits of peat known in several localities in California, small amounts of which are used as a fertilizer, and in stock-food preparations, but none has yet been recorded as utilized for fuel.

Comparison of values during 1928 and 1929 is shown in the following table:

Substance	1928		1929		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Coal	450 tons	$2,476	10,885 tons	$59,858	$57,382+
Natural gas	400,129,201 M.cu.ft.	29,067,546	315,513,952 M.cu.ft.	24,559,840	4,507,706—
Petroleum	292,534,221 bbls.	321,366,863	227,328,988 bbls.	271,699,046	49,667,817—
Total values		$350,436,885		$296,318,744	
Net decrease					$54,118,141

COAL

Bibliography: State Mineralogist Reports VII, XII–XV (inc.), XVII, XIX–XXVIII (inc.), XXVI. U. S. Geol. Surv., Bulletins 285, 316, 431, 471, 581; Ann. Rept. 22, Pt. III.

The coal produced in California during 1930 totaled 10,885 short tons valued at $59,858 at the mine and coming from a single property in each; Amador, Monterey, and Trinity counties. The 1930 output showed an increase in both quantity and value over that of 1929, which was 450 short tons worth $2,476. This increase in output was accounted for by the reopening of the Stone Canyon mine which had been down for some years. This coal was consumed by the local market and also used on the property for camp purposes, power and forge, to carry on regular operations and development work.

Total Coal Production of California.

The very considerable output of coal in the years previous to 1883 was almost entirely from the Mount Diablo district, Contra Costa County. Later the Tesla mine in Corral Hollow, Alameda County, was an important producer for a few years. Stone Canyon, Monterey County, was also an important producer for a short time, and there has been some coal shipped from properties in Amador, Fresno, Orange, Riverside, Siskiyou and Trinity counties. The following tabulation gives the annual tonnages and values, according to available records:

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Coal Output and Value, by Years

Year	Tons	Value	Year	Tons	Value
1861	6,620	$38,065	1897	87,449	$196,255
1862	23,400	134,550	1898	143,045	337,475
1863	43,200	248,400	1899	160,941	420,109
1864	50,700	291,525	1900	176,956	535,531
1865	60,530	348,048	1901	150,724	401,772
1866	84,020	483,115	1902	88,460	248,622
1867	124,690	716,968	1903	93,026	265,383
1868	143,676	826,137	1904	79,062	376,494
1869	157,234	904,096	1905	46,500	144,500
1870	141,890	815,868	1906	24,850	61,600
1871	152,493	876,835	1907	23,734	55,849
1872	190,859	1,097,439	1908	18,496	55,503
1873	186,611	1,073,013	1909	49,389	216,913
1874	215,352	1,238,274	1910	11,033	23,484
1875	166,638	958,169	1911	11,047	18,297
1876	128,049	736,282	1912	14,484	39,092
1877	107,789	619,787	1913	25,198	85,809
1878	134,237	771,863	1914	11,859	28,806
1879	147,879	850,304	1915	10,299	26,662
1880	236,950	1,362,463	1916	4,037	7,030
1881	140,000	805,000	1917	3,527	7,691
1882	112,592	647,404	1918	6,343	16,149
1883	76,162	380,810	1919	2,983	8,203
1884	77,485	309,950	1920	2,078	5,450
1885	71,615	286,460	1921	12,467	63,578
1886	100,000	300,000	1922	27,020	135,100
1887	50,000	150,000	1923	1,010	5,090
1888	95,000	380,000	1924	1,425	8,800
1889	121,280	288,232	1925	730	3,880
1890	110,711	283,019	1926	1,100	5,000
1891	93,301	204,902	1927	200	1,100
1892	85,178	209,711	1928	782	4,542
1893	72,603	167,555	1929	450	2,476
1894	59,887	139,862	1930	10,885	59,858
1895	79,858	193,790			
1896	70,649	161,335	Totals	5,220,727	$23,171,334

The tonnages in the above table for the years 1861–1886 (incl.) are taken from the U. S. Geological Survey, "Mineral Resources of the U. S., 1910," p. 107. The values assigned for the years previous to 1883 are those given by W. A. Goodyear (Mineral Res., 1882, pp. 93–94), being an average of $5.75 per ton. From 1887 to date the figures are those of the California State Mining Bureau.

NATURAL GAS

Bibliography: State Mineralogist Reports VII, X, XII, XIII, XIV, Bulletins 3, 16, 19, 69, 73, 89. Monthly Summary, Oil & Gas Supervisor, Dec., 1919; Aug., 1922; Mar., 1923; Mar. and Apr., 1926.

Statistics on the production of natural gas in California are in a considerable degree difficult to arrive at, as much of it that is utilized directly at the wells for heating, lighting, and driving gas engines is not measured. Hence, it is necessary to approximate the output of many of the operators in the oil fields, estimated on the number of lights, and on the number and horsepower of gas engines and steam boilers thus operated. The figures here given are for gas utilized locally and also that sold for distribution to consumers; and we consider are not overestimated, particularly in the six oil-producing counties. It must be remembered that some of our important oil fields are removed many miles from the site of any other industry, and that the gathering of small amounts of gas and transporting it for any considerable distance may not always be profitable, nor is it often possible to have pipe-line

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facilities available to handle the gas accompanying the early gas production in newly developed fields. Wherever feasible, casing-head gas is used in driving gas engines for pumping and drilling, and in firing the boilers of steam-driven plants.

The most notable gas developments in California have been in the Elk Hills and Buena Vista Hills in Kern County, northeast of the Midway district; in the oil fields in the Los Angeles basin, Los Angeles and Orange counties; in Ventura County; and during 1928 the bringing in of the Kettleman Hills field in Kings County.

The use of natural gas will be furthered in the industry of the state; first, by the construction of pipe lines to all of the principal cities in the state, and, second, by a law passed by the last legislature making the unreasonable waste of natural gas illegal. Heretofore all gas that could not be sold or used on the property was wasted, but now it has to be used or the well is closed in until such a time when it can be used.

Pipe Lines and Distribution of Natural Gas.

During the past twelve years more than 5000 miles of natural gas pipe lines have been laid in California. With the laying of the pipe lines the amount of natural gas used has increased as well as the uses to which it is put. At the present time, the value of this material is second only to petroleum. Natural gas is also being compressed into containers of various sizes and shipped in this form to places where it is not practical to build pipe lines.

The compressed gas in small containers makes it possible for people living in isolated places to have gas for cooking, heating, and lighting. There is a project now under way to compress the natural gas into specially built tank cars, ship it to Oregon and Washington and there distribute it to the gas mains of the various towns. This system will give service to California cities not accessible to pipe lines.

The year 1930 saw a continuation in the construction of natural gas pipe lines from the major oil fields to the larger centers of population, and the addition of new projects. There is a line from Kettleman Hills to Los Angeles to be built; also branch lines from that running up the San Joaquin to San Francisco and to all of the principal towns in the San Joaquin and lower Sacramento valleys not already serviced with natural gas.

In 1929 a law was passed prohibiting the unreasonable waste of natural gas, which has lessened the per cent of gas wasted and has encouraged the finding of new domestic and industrial uses for this material. The following table shows the total amount of natural gas coming from oil gas wells in California during 1930; that which was utilized for fuel, light and power; that which was wasted (blown into the air); and that which is pumped into old gas wells for storage.

Actual Production of Natural Gas—How Disposed of in California

County	*M cu. ft. produced*	*M cu. ft. utilized*	*M cu. ft. wasted*	*M cu. ft. stored*
Fresno	396,827	393,337	3,490	
Kern	37,787,695	27,908,423	6,116,578	3,762,694
Kings	157,102,080	47,959,591	108,927,320	215,169
Los Angeles	247,009,811	156,470,411	82,252,467	8,286,933
Orange	22,891,543	21,518,952	986,169	386,422
Santa Barbara	16,205,794	6,274,436	9,897,613	33,745
Ventura	63,541,515	54,741,670	7,695,372	1,104,473
Other counties	247,132	247,132		
Totals	545,182,397	315,513,952	215,879,009	13,789,436

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Production and Value.

There is rather a wide variation in prices quoted for natural gas because a considerable part is used directly in the field for driving gas engines and firing boilers, and is therefore not measured nor sold. Such companies as have placed a valuation on the gas that was thus used in 1930 gave from 2¢ to 26¢ per 1000 cu. ft. at the well. From the totals shown in the tabulation following herein, the average value for all fields in 1930 works out at approximately 7.78¢ per M cu. ft. Approximately 7000 cu. ft. of gas is equal to one barrel of oil in heating value, and is so accounted for by many operators. In driving gas engines, about 4000 cu. ft. per 24 hr. are consumed by a 25-h.p. engine, and 63,700 cu. ft. per day for heating a 70-h.p. steam boiler, which figures have been utilized in compiling this report, in those cases where gas was not metered.

Natural Gas 'Consumed' or Utilized for Fuel, 1930

County	*M cu. ft.*	*Value*
Fresno	393,337	$26,108
Kern	27,908,423	1,290,099
Kings	47,959,591	3,668,722
Los Angeles	156,470,411	14,065,968
Orange	21,518,952	1,394,600
Santa Barbara	6,274,426	299,918
Ventura	54,741,670	3,749,829
Butte, Humboldt, Lake, Mendocino, Sacramento, San Joaquin, San Mateo, and Santa Clara*	247,132	64,605
Totals	315,513,952	$24,559,840

* Combined to conceal the output of a single operator in each.

The above total was a decrease in both quantity and value from the 1929 output utilized, which was 400,129,204 M cu. ft. worth $29,675,546. The year 1929 had the largest annual production of natural gas in California. As in the past Los Angeles County production was the largest with 156, 470,411 M cu. ft. worth $14,065,968, although this was a decrease from the 1929 figures, which were 288,708,726 M cu. ft. and $17,410,493, with the exception of Kings County, all counties showed a decrease in the amount of natural gas utilized.

Natural Gas Production in California, Since 1888.

The production of natural gas in California by years since 1888 is given in the following table. The first economic use of natural gas in California was from the famous courthouse well at Stockton, bored in 1854–1858. Beginning about 1883 and for several succeeding years, a number of gas wells were brought in around Stockton. Natural gas was known in a number of other localities, and occasionally utilized in a small way, notably at Kelseyville in Lake County, and in Humboldt County near Petrolia and Eureka, but there are no available authentic records of amounts or values previous to the year 1888. The most important developments in the commercial production of natural gas have been coincident with developments in the oil fields, by utilizing the casing-head gas as well as that from dry-gas wells.

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Natural Gas Production in California Since 1888

Year	M cubic feet	Value	Year	M cubic feet	Value
1888	a12,000	$10,000	1910	10,579,933	$1,676,367
1889	a14,500	12,680	1911	a5,000,000	491,85[illegible]
1890	a41,250	33,000	1912	a12,600,000	940,07[illegible]
1891	a39,000	30,000	1913	14,210,836	1,053,29[illegible]
1892	a75,000	55,000	1914	16,529,963	1,049,47[illegible]
1893	a84,000	68,500	1915	21,992,892	1,706,48[illegible]
1894	ab85,080	79,072	1916	28,134,365	2,871,75[illegible]
1895	ab110,800	112,000	1917	44,343,020	2,964,92[illegible]
1896	ab131,100	111,457	1918	46,373,052	3,289,52[illegible]
1897	a71,300	62,657	1919	52,173,503	4,041,21[illegible]
1898	a111,165	74,424	1920	58,567,772	3,898,28[illegible]
1899	115,110	95,000	1921	67,043,797	4,704,67[illegible]
1900	40,566	34,578	1922	103,628,027	6,990,03[illegible]
1901	120,800	92,034	1923	240,405,397	15,661,43[illegible]
1902	120,968	99,443	1924	209,021,596	15,153,14[illegible]
1903	120,134	75,237	1925	194,719,924	15,890,08[illegible]
1904	144,437	91,035	1926	214,549,477	19,465,34[illegible]
1905	148,345	102,479	1927	224,686,940	20,447,29[illegible]
1906	168,175	109,489	1928	260,887,116	22,260,94[illegible]
1907	169,991	114,759	1929	400,129,201	29,675,54[illegible]
1908	842,883	474,584	1930	315,513,952	24,559,84[illegible]
1909	1,148,467	616,932	Totals	2,545,905,834	$201,345,94[illegible]

a Quantity, in part, estimated, where values only were reported.
b Includes natural CO_2 from a mine in Santa Clara County.

Gasoline from Natural Gas.

More or less gas usually accompanies the petroleum in the oil fields, and such gas carries varing amounts of gasoline. A total of 145 plants were in operation in 1929 recovering gasoline by compression or absorption from this 'casing-head' gas. After the gasoline is extracted the remaining 'dry gas' so far as practicable is taken into pipe lines, by which it is distributed to consumers, both domestic and commercial.

In certain of the old fields, some of the casing-head gasoline is obtained as an incidental product to the compressing of the natural gas preliminary to its transmission to consuming centers through the gas pipe lines. Some concerns market the casing-head gasoline separately, others blend it with distillery gasoline, while others turn it into the oil pipe lines thus mixing this high-gravity gasoline with the crude oil for transportation to the refinery where it is later regained.

A total of 842,958,320 gallons of casing-head gasoline valued at $56,870,002 was reported made from all fields by 140 plants during 1930, compared with 804,156,700 gallons worth $55,168,970 from 145 plants in 1929. It was distributed as follows:

Natural-Gas Gasoline Recovered, 1930

County	*No. plants*	*Gallons*	*Value*
Kern	24	55,400,973	$5,145,873
Kings	6	156,420,534	8,603,129
Los Angeles	71	461,805,136	31,065,648
Orange	20	69,129,364	4,812,902
Santa Barbara	5	25,194,102	1,992,125
Ventura	13	73,964,168	5,245,905
Others	1	44,043	4,420
Totals	140	842,958,320	$56,870,002

The usual recoveries of gasoline from natural gas vary from ½ gal. to 3 gal. per 1000 cu. ft. of gas handled, the average being about 1 gal. per 1000 cu. ft. The U. S. Bureau of Mines report by Knudsen[1] gives

[1] Knudsen, E. T., Statistical summary of California Petroleum Industry, 1930: U. S. Bureau of Mines, 1931, p. 55.

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the average recovery for 1930 as 1.370 gallons per 1000 cu. ft. of gas treated. His figures show the following production, by methods:

Natural-Gas Gasoline Production, 1930, by Methods

Per U. S. Bureau of Mines

	M cu. ft. natural gas treated	*Gallons gasoline recovered*	*Recovery, gal. per M cu. ft.*
Oil absorption	599,852,566	822,291,289	1.371
Compression	2,756,208	3,037,708	1.102
Totals	602,608,774	825,328,997	1.370

PETROLEUM

Bibliography: State Mineralogist Reports IV, VII, X, XII, XIII. Bulletins 3, 11, 16, 19, 31, 32, 63, 69, 73, 82, 84, 89. Reports of Oil and Gas Supervisor 1915 to date (issued in monthly chapters since April, 1919, to June, 1929, and quarterly from then on). U. S. Geol. Surv. Bulletins 213, 285, 309, 317, 321, 322, 340, 357, 398, 406, 431, 471, 541, 581, 603, 621, 623, 653, 691. Prof. Papers 116, 117. "American Petroleum; Supply and Demand"; Amer. Petr. Inst., 1925.

The crude petroleum produced in California during 1930 amounted to a total of 227,328,988 barrels having a value of $271,699,046 at the well; this was a decrease from the 1929 output which was the largest annual production in the state.

This total of quantity is compiled from the monthly production reports filed by the operators with the State Oil and Gas Supervisor, to which have been added figures for the output of a number of small operators in the old Los Angeles City Field not under the jurisdiction of the Supervisor.

The question of the value of the crude oil yield at the well is a difficult one to settle with exactitude principally because a large part of the output is not sold until after refining. The large refiners are also large producers of crude oil which they send direct from well to plant, hence much of the crude oil is not sold as such.

The value used in the statistical reports of the State Mining Bureau and the Division of Mines and Mining from 1914 to 1927 (inc.) was derived from an average of actual sales of crude oil of all grades in each field of the state and their average applied to the total yield of each respective field. The 1929–1930 values, used by the Division of Mines, were obtained by using the production of crude oil by gravities produced in each field[1] and applying an average of current prices quoted in Oil Bulletin for crude oil at the well.

Features of 1930.

The noteworthy features of the year 1930 in the oil industry in California were: curtailment in production of crude petroleum; deep drilling and deepening of wells in proved fields; some increase in production in Kings, Santa Barbara, and Kern counties and decreases in Los Angeles, Ventura, Orange, and Fresno counties.

Summarizing the data for the year, the State Oil and Gas Supervisor[2] presented the following figures:

[1] By courtesy of Standard Oil Co.

[2] Bush, R. D., Resume of Oil Field Operations of California in 1929, Summary of Operations—California Oil Fields, Vol. 16, No. 3, Jan., Feb., March, 1931.

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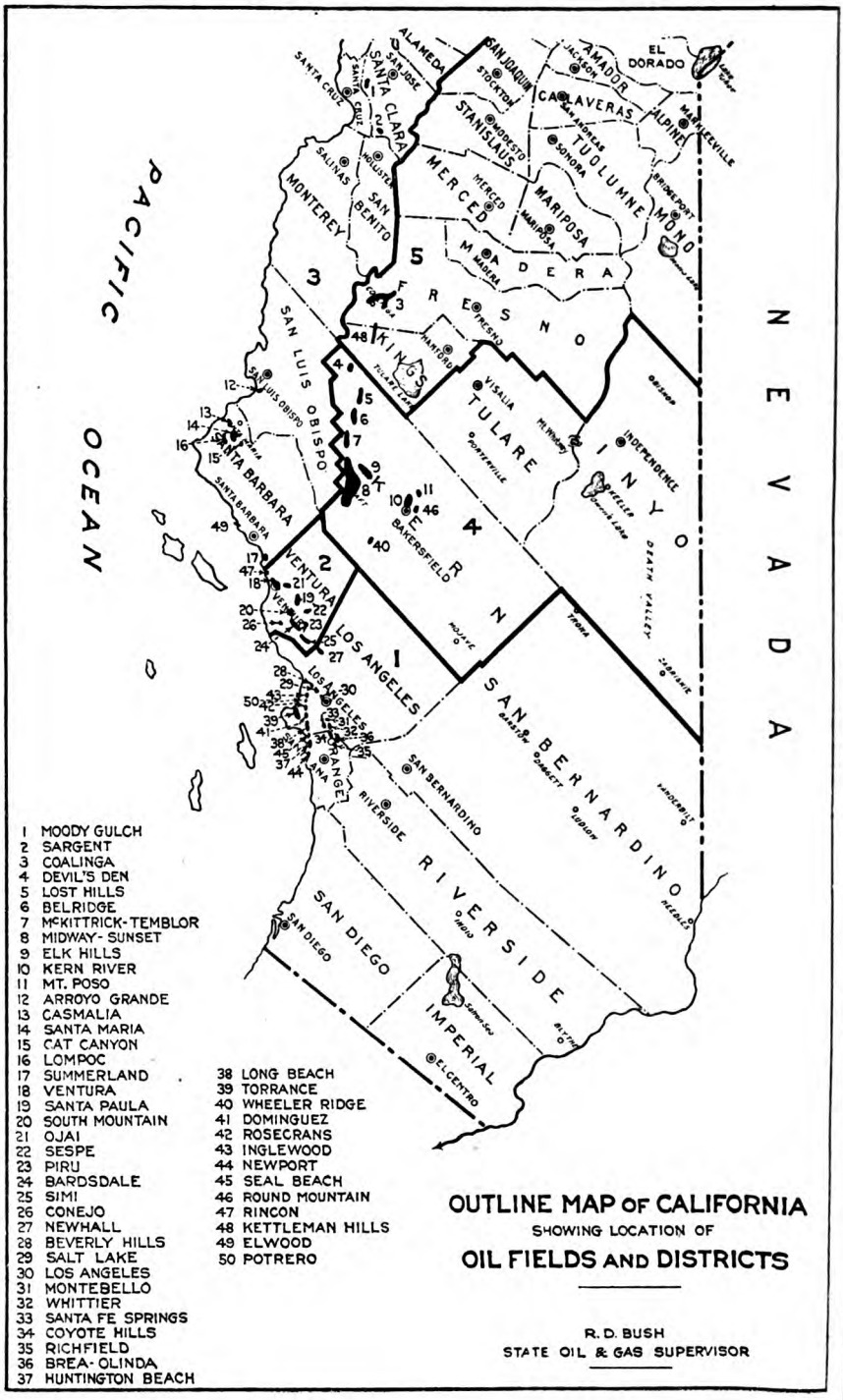

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Production.

"The total production in the state for the last six months of 1930 was 109,298,614 barrels of oil and 50,546,364 barrels of water. The production of oil for the year 1930 was, therefore, 227,150,429 barrels, a decrease of 65,258,768 barrels compared with that of 1929.

"The production of oil for the second half of 1930 was 8,553,201 barrels less than for the first half. Water production increased 1,482,342 barrels during the same period.

* * * * * * *

"The estimated closed-in production was increased during 1930 from 202,745 barrels daily in February to a maximum of 257,477 barrels in December.

* * * * * * *

Storage and Price Changes.

"The total crude and refined petroleum in storage in Pacific coast territory at the end of 1930 was 181,033,141 barrels, according to the American Petroleum Institute. The decrease in storage during the year amounted to 3,784,178 compared with an increase of 44,816,425* barrels during 1929. The total amount of crude and refined oil shipped to eastern ports during 1930 was 25,643,000 barrels, or 2,538,000 barrels less than the 1929 shipments. In March prices of crude oil between 18 degrees and 28 degrees gravity and higher were incrased 1 to 25 cents per barrel, and in the valley fields oil below 18 degrees gravity was increased 5 cents per barrel. In September oil of 24 degrees gravity and above was reduced 2 to 12 cents per barrel.

Drilling and Development.

"During 1930, 918 wells were reported to the State Oil and Gas Supervisor as ready to drill as compared with 1256 new wells in 1929. Discoveries of oil of minor importance were made in the Los Angeles Basin both in new areas and in deeper zones in some of the fields. The most important discoveries were made in Kern County in the Mountain View area near Bakersfield and from the Temblor sands in the North Belridge field. Development of the Kettleman Hills field continued at a moderate rate, each new well completion adding to the tremendous known resources of both oil and natural gas."

TABLE A

Production and Value of Crude Oil, by Counties

County	1929 Barrels	1929 Value	1930 Barrels	1930 Value
Fresno	3,498,107	$1,781,586	3,362,902	$1,910,128
Kern	43,577,420	32,299,584	44,170,810	37,015,139
Kings	1,968,729	3,294,668	6,176,130	9,437,771
Los Angeles	182,444,261	216,871,493	114,533,366	148,549,776
Orange	25,861,815	25,504,922	23,113,820	24,500,649
Santa Barbara	11,141,789	13,984,055	15,914,132	22,343,440
Ventura	24,003,969	27,602,164	19,983,341	27,896,744
Colusa, San Luis Obispo. Santa Clara, Tulare	*38,131	28,391	74,487	45,399
Totals	292,534,221	$321,366,863	227,328,988	$271,699,046

* Combined to conceal output of a single operator in each.

* Revised figure.

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The foregoing totals show the average price of $1.195 per barrel for the year in 1930, as compared with $1.094 in the year 1929, $0.992 in 1928, $1.127 in 1927 and $1.538 in 1926.

TABLE B

Average Price of Oil Per Barrel, by Counties, 1921-1930

County	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Fresno	$1.483	$1.068	$1.710	$1.162	$1.094	$0.815	$0.830	$0.764	$0.519	$0.568
Kern	1.714	1.211	.819	1.137	1.432	1.448	1.139	.835	0.741	.838
Kings									1.674	1.515
Los Angeles	1.532	1.403	.971	1.239	1.429	1.645	1.115	1.051	1.189	1.297
Orange	2.138	1.175	.880	1.183	1.417	1.559	1.207	.935	0.986	1.060
San Luis Obispo	1.400	.942	.600	.992	1.087					
Santa Barbara	1.575	1.011	.782	1.036	.914	.793	.750	1.108	1.255	1.404
Santa Clara	1.485	1.616	1.404	1.921	1.634					
Ventura	2.507	1.785	1.138	1.334	1.710	1.512	1.177	1.098	1.150	1.396
State averages	$1.726	$1.249	$0.923	$1.200	$1.422	$1.538	$1.127	$0.992	$1.094	$1.195

For several years previous to 1919, the state average value per barrel at the well for crude oil as determined by the statistical returns was noted to practically coincide with the quotations during the same years for 23° gravity oil in the San Joaquin Valley fields. In 1919 and since, the average values have worked out at figures corresponding to quotations up to, in one year as high as 28° oil, due to the large yield of high-gravity oils from the new fields in the Los Angeles-Orange counties area.

TOTAL PETROLEUM PRODUCTION OF CALIFORNIA

The presence of oil seepages and springs in Los Angeles and Ventura counties was known and utilized in a small way early in the history of California. Some also was shipped to refineries at San Francisco from Santa Barbara and Humboldt counties. In the light of present-day developments, the following reference to the previous year's production of oil and its future prospects as expressed by the San Francisco Bulletin of January 8, 1866, is strikingly prophetic even though skeptical:

"It is possible that the small quantity received (40,000 or 50,000 gallons in 1865) may be the forerunner of many millions which will, at some future time, lubricate the wheels of commerce and set a trade at work excelling in variety any that has thus far been known on this coast. At present, however, we admit to being a little skeptical about the assumption of the astute Professor Silliman that California will be found to have more oil in its soil than all the whales in the Pacific Ocean."

According to Hanks,[1] in 1874 production amounted to 36 bbl. per day from natural flows in Pico Cañon (Newhall), and at Sulphur Mountain (Ventura County), the oil being of 32° gravity average.

"Work was commenced in Pico Canyon in 1875 by drilling three shallow wells with spring pole, all of which yielded oil at depths of from 90 to 250 feet. Actual work of development commenced with steam machinery in 1877."[2]

In 1877 Pico averaged 40–50 bbl. daily, and Ventura 80 bbl. daily. In 1878, there was some production (@ 60 bbl. per day, for a time) from wells in Moody Gulch, near Los Gatos, Santa Clara County, the oil being of 46° Baumé.

[1] Hanks, Henry G., Report IV of State Mineralogist, p. 298, 1884.
[2] *Idem*, p. 301.

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The first wells in the Coalinga, Fresno County, and Summerland, Santa Barbara County, fields were drilled in 1890, but Coalinga did not make its influence felt conspicuously on the state's annual output until 1903. The Summerland yield never has been large. The Salt Lake field near Los Angeles began production in 1894 and in 1897 reached over a million barrels annually.

In the Kern County fields, the first well was drilled in Sunset in 1891, Midway in 1900, McKittrick in 1892, Kern River in 1899. The Sunset-Midway district attained a yield of over 4,000,000 bbl. in 1909, and over 20,000,000 bbl. in 1910. Kern River field produced over 3,000,000 bbl. in 1901.

The first well in the Santa Maria-Lompoc group, Santa Barbara County, was drilled in 1901, and the district advanced to a yield of over 3,000,000 bbl. annually in 1905.

The Whittier-Fullerton field in Los Angeles and Orange counties became an important factor in 1902. The Montebello field, Los Angeles County, was the conspicuous addition in 1918-1919; and Elk Hills, Kern County, with Huntington Beach and Richfield, Orange County, in 1920. In 1921, the new fields added were Long Beach and Santa Fe Springs, Los Angeles County; in 1922, Torrance field in Los Angeles County, and Wheeler Ridge field in Kern County; but the production from the large number of new wells started in these new Los Angeles County fields did not reach its peak until August and September, 1923. Dominguez (Compton) came in during 1923; followed by Rosecrans and Inglewood in 1924. Ventura recorded important additions to its producing area in 1925 and 1926. Seal Beach, Orange County, and Mt. Poso, Kern County, were the new fields added in 1926; Round Mountain, Kern County, and Rincon, Ventura County, were the new fields added in 1927; with Potrero in Los Angeles County, Elwood in Santa Barbara County and Kettleman Hills in Kings County in 1928.

During 1929 Playa Del Rey was added to the oil fields in Los Angeles County.

The effect of the advent of these various fields to the producing column will be noted in the tabulation herewith, by years:

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TABLE C

Total Petroleum Production in California

Year	Barrels	Value	Year	Barrels	Value
To and inc. 1875	[a] 175,000	[b] $472,500	1904	29,736,003	$8,317,809
1876	12,000	30,000	1905	34,275,701	9,007,820
1877	13,000	29,250	1906	32,624,000	9,238,020
1878	15,227	30,454	1907	40 311,171	16,783,943
1879	19,858	39,716	1908	48,306,910	26,566,181
1880	40,552	60,828	1909	58,191,723	32,398,187
1881	99,862	124,828	1910	77,697,568	37,689,542
1882	128,636	257,272	1911	84,648,157	40,552,088
1883	142,857	285,714	1912	89,689,250	41,868,344
1884	262,000	655,000	1913	98,494,532	48,578,014
1885	325,000	750,750	1914	102,881,907	47,487,109
1886	[a] 377,145	[b] 870,205	1915	91,146,620	43,503,837
1887	678,572	1,357,144	1916	90,262,557	57,421,334
1888	690,333	1,380,666	1917	95,396,309	86,976,209
1889	303,220	368,048	1918	99,731,177	127,459,221
1890	307,360	384,200	1919	101,182,962	142,610,563
1891	323,600	401,264	1920	103,377,361	178,394,937
1892	385,049	561,333	1921	112,599,860	203,138,225
1893	470,179	608,092	1922	138,468,222	173,381,265
1894	783,078	1,064,521	1923	262,875,690	242,731,309
1895	1,245,339	1,000,235	1924	228,933,471	274,652,874
1896	1,257,780	1,180,793	1925	232,492,147	330,609,829
1897	1,911,569	1,918,269	1926	224,673,281	345,546,677
1898	2,249,088	2,376,420	1927	231,195,774	260,735,498
1899	2,677,875	2,660,793	1928	231,811,465	229,998,680
1900	4,329,950	4,152,928	1929	292,534,221	321,366,863
1901	7,710,315	2,961,102	1930	227,328,988	271,699,046
1902	14,356,910	4,692,189			
1903	24,340,839	7,313,271	Totals	3,527,499,220	$3,646,701,209

[a] U. S. G. S., Min. Res. of U. S., 1886, p. 440, for quantities to and including 1886.
[b] Values have been estimated for the years to and including 1886, after consulting a number of contemporaneous publications, including the Mining & Scientific Press, Reports of the State Mineralogist, and U. S. Reports. The figures for 1887 to date are from records of the State Mining Bureau.

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Outlook.

The following table copied from The Oil Bulletin [1] gives the allotment by fields in California agreed on by the Operators General Committee on Curtailment on May 27. This action is to govern the production from June 1, 1931, to January 1, 1932.

CALIFORNIA PRORATION SCHEDULE

June 1, 1931, to January 1, 1932

Fixed allotment fields	*Approved May potential*	*May allotment*	*June 1 allotment*	*Difference*
Belridge	8,950*	4,000	6,500*	+2,500
Brea-Olinda	23,670	10,600	9,500	—1,100
Capitan	1,200	------	------	------
Coalinga	33,510	8,900	8,000	—900
Dominguez	17,745*	11,500	11,500*	------
East Coyote	3,730	1,600	1,450	—150
Elwood	98,800	29,000	26,000	—3,000
Fruitvale	7,830	2,500	2,250	—250
Inglewood	21,850	16,000	14,400	—1,600
Kern River	11,500	2,750	2,500	—250
Lawndale	300*	300	300*	------
Los Angeles	1,500*	1,500	1,350	—150
Lost Hills	6,500*	350	2,100*	+1,750
McKittrick	4,500*	3,600	2,500*	—1,100
Midway-Maricopa	98,875*	55,800	52,500*	—3,300
Montebello	8,850	7,200	6,500	—700
Round Mountain	13,000*	1,600	1,200*	—400
Santa Maria	11,975	2,500	2,250	—250
Summerland	250*	250	250*	------
Ventura Avenue	97,270	44,500	40,000	—4,500
Ventura-Newhall	5,970	3,900	3,500	—400
Watsonville	60	60	50	—10
West Coyote	12,400*	8,500	8,500*	------
Wheeler Ridge	590*	590	550	—40
Whittier	1,425	1,250	1,350*	—100
Fixed field totals	492,250	218,750	205,000	—13,750
Variable allotment fields				
Elk Hills	28,760	13,500	12,200	—1,300
Huntington Beach	42,980	20,500	18,300	—2,200
Kern Front	18,200	8,800	7,700	—1,100
Long Beach	179,775	89,350	76,500	—12,850
Mount Poso	20,900	8,500	8,900	+400
New Fields	300	------	100	+100
Playa Del Rey	37,875	19,000	16,100	—2,900
Potrero	1,250	625	550	—75
Richfield	14,835	7,050	6,300	—750
Rincon	3,030	1,300	1,300	------
Rosecrans	7,775	3,700	3,350	—350
Santa Barbara	525	150	200	+50
Santa Fe Springs	129,225	61,850	55,000	—6,850
Seal Beach	24,970	15,925	10,600	—5,325
Torrance	12,600	6,000	5,400	—600
Variable field total	523,000	256,250	222,500	—33,750
State totals (ex Kettleman Hills)	1,015,250	475,000	427,500	—47,500

NOTES:

The potentials and allotments here given do not include Kettleman Hills.

The proposed allotments for fixed fields represent an average reduction of 10 per cent from the current allotments except for those fields marked * where an additional reduction is considered practicable or where additional curtailment will be extemely difficult or impossible.

The proposed allotments for variable fields represent a proration on the basis of the approved potentials of the total amount of 222,500 B/D available for all variable fields. Minor numerical adjustments of the exact figures have been made in order to express field allotments in readily comprehended round numbers:

Average curtailment of fixed fields=58.35 per cent.

Average curtailment of variable fields=57.45 per cent.

[1] Oil Bulletin, Vol. XVII, No. 6, June, 1931.

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Well Data.

The following table is compiled from the monthly statements issued by the American Petroleum Institute:

TABLE D

Wells Operated, by Fields, 1930

Field	Wells producing Dec. 1929	Wells producing Dec. 1930	Wells completed during year	Daily initial output	Wells abandoned during year	Bbls. per well produced per day Dec. 1929	Bbls. per well produced per day Dec. 1930
Kern River	963	887	17	3,385	4	19.4	16.5
Mount Poso	58	66	24	3,041	4	196.0	161.2
Fruitvale	11	18	7	2,400	7	278.5	137.5
Round Mountain	12	4	20	4,935	7	210.8	818.5
McKittrick	282	239	3	105	0	17.0	17.1
Midway-Sunset	2,120	1,868	68	33,668	80	34.3	34.4
Elk Hills	204	212	1	400	4	81.3	84.9
Lost Hills-Belridge	322	164	5	80	7	14.4	21.9
Coalinga	755	739	1	10	13	12.5	12.5
Kettleman Hills	2	8	6	21,908	3	4,689.5	2,126.5
Buttonwillow Gas Field							0.0
Wheeler Ridge	33	34			0	19.4	17.7
Watsonville	7	6			4	9.0	10.3
Santa Maria	209	184	1	275	19	18.0	17.2
Capitan	1	5	7	1,120	3	0.0	13.8
Summerland	96	97	3	225	3	4.8	3.3
Elwood-Goleta	22	52	31	122,312	3	1,444.0	769.5
Santa Barbara	2	2	2	1,150	7	69.0	17.5
Rincon	31	33	5	1,460	5	105.0	83.3
Ventura Avenue	140	145	36	51,530	3	363.7	330.5
Ventura-Newhall	518	414	10	967	24	9.5	11.7
Los Angeles-Salt Lake	311	259			65	4.9	5.8
Whittier	168	160			4	9.1	8.9
Fullerton (Brea-Olinda)	371	367	1	50	2	37.9	33.0
Coyote	208	183	6	2,793	1	53.5	58.2
Santa Fe Springs	486	464	148	123,916	33	344.7	258.5
Montebello	176	164	1	241	10	51.3	45.3
Richfield	294	175	10	1,795	11	50.1	57.0
Huntington Beach	557	404	10	964	20	74.6	75.3
Long Beach	990	905	142	90,288	32	106.0	110.8
Torrance	595	526			27	21.2	21.4
Dominguez	57	62			2	183.0	157.0
Rosecrans	103	100	6	2,872	17	69.3	66.7
Inglewood	228	211	5	1,137	2	98.0	83.8
Newport	3	4			3	10.0	10.0
Seal Beach	161	127	2	565	9	187.1	173.2
Potrero	11	17	14	6,880	10	68.7	102.9
Lawndale	7	8			1	110.4	44.8
Playa del Rey	1	141	163	104,049	8	810.0	91.7
Miscellaneous drilling					117		
Totals	10,515	9,454	755	584,521	574	*66.6	*66.1

*State average.

Specific Gravity of Oils Produced.

The proportion of heavy and light oil produced in the various fields is shown in Table E, following, for which we are indebted to the Standard Oil Company. Under present practice, oil below 18° Baumé may be considered as largely refinable for fuel and lubricants, while the lighter oils yield varying amounts of the higher refined products with corresponding proportions of residuum and fuel oil. Specific gravities in California range from 8° Baumé in the Casmalia field, Santa Barbara County, to 56° Baumé in Ventura County and 60° in Kettleman Hills, Kings County.

California crude oils are all essentially of asphalt base, with a few notable exceptions. In the following localities are wells yielding crudes containing both asphalt and paraffine constituents: Oil City field, Coalinga; a few deep wells in East Side field, Coalinga; a considerable part

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of the Ventura County fields; Western Minerals area, south of Maricopa; Wheeler Ridge, Kern County.

TABLE E

Production of Light and Heavy Oils, by Fields, for 1930

Field	Under 20° (barrels)*	20° above (barrels)*	Total (barrels)*
Kern River	5,372,677		5,372,677
Mt. Poso	3,930,406		3,930,406
Round Mountain	584,924	613,136	1,198,060
Fruitvale	17,988	883,452	901,440
Lost Hills-Belridge	255,160	1,080,148	1,335,308
McKittrick	1,489,214	1,560	1,490,774
Elk Hills	1,910,576	4,660,052	6,570,628
Midway-Sunset	6,750,281	16,888,898	23,639,179
Wheeler Ridge		219,590	219,590
Coalinga	3,285,918	106,364	3,392,282
Kettleman Hills	150	6,225,821	6,225,971
Watsonville	23,725		23,725
Arroyo Grande	26,250		26,250
Lompoc	32,439	6,100	38,539
Santa Maria	374,792	720,641	1,095,433
Capitan	17,211	7,377	24,588
Elwood		14,608,876	14,608,876
Santa Barbara-Mesa	11,505	1,240	12,745
Summerland	166,790		116,790
Rincon		1,011,878	1,011,878
Ventura Avenue		17,514,244	17,514,244
Ventura County	15,144	1,574,370	1,589,514
Newhall	114,894	72,766	187,660
Salt Lake	417,660		417,660
Los Angeles	148,170		148,170
Montebello	277,029	2,417,614	2,694,643
Whittier	356,868	160,739	517,607
Coyote	16,800	3,867,890	3,884,690
Fullerton	405,629	4,020,744	4,426,373
Richfield	332,146	3,302,107	3,634,253
Santa Fe Springs		44,247,244	44,247,244
Huntington Beach	1,523,438	9,586,544	11,109,982
Torrance	2,023,447	2,108,624	4,132,071
Dominguez	150,012	3,521,834	3,671,846
Lawndale		140,026	140,026
Playa del Rey	28,128	4,628,683	4,656,811
Rosecrans	22,056	2,375,338	2,397,394
Inglewood	3,371,280	3,060,382	6,431,662
Long Beach	210,300	36,387,769	36,598,069
Seal Beach		8,026,061	8,026,061
Potrero		626,663	626,663
Terra Bella	400		400
Newport	13,871		13,871
Totals	33,627,278	194,674,775	228,302,053

* Barrels of 42 gallons.

As previously noted by Bradley,[1] a decided change has taken place in the relative proportions of light and heavy crudes produced in California since 1920, taking 18° Baumé as the dividing line. This subject has also been covered in detail and with charts, by Collom and Barnes.[2]

A marked drop took place in the low-gravity yield from 1910 to and including 1914. From 1914, it remained almost stationary, with a slight drop in 1921, while the high-gravity yield has increased at a rapid rate since 1915. The proportions have been reversed from approximately 75% low—25% high in 1914 to 25% low—75% high in 1921; 10% low—90% high in 1923; 14% low—86% high in 1924–1929; 17% low—83% high in 1930.

This has been an important factor in its effect upon the average price per barrel of the state's output in these years, as well as its effect

[1] Bradley, W. W., Mineral Production of California in 1921; Cal. State Min. Bur., Report XVIII, p. 442, Sept., 1922.

[2] Collom, R. E., and Barnes, R. M., California Oil Production and Reserves; Cal. State Min. Bur., Ninth Ann. Rep. of State Oil and Gas Supervisor, Aug., 1923, pp. 5–23.

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upon the relative situation between production and consumption. It has been a fortunate development, in view of the increased demand for refinery products (gasoline in particular).

Oil in 'Storage.'

Field, refinery, pipe-line, and tank-farm stocks of crude and refined products in the Pacific Coast territory totaled 181,033,141 barrels [1] December 31, 1930, as compared with 184,817,319 barrels on December 31, 1929. The total decrease in stock for the year was 3,784,178 barrels.

	December 31, 1930 (barrels)	*December 31, 1929 (barrels) revised*
Heavy crude, heavier than 20° A. P. I., including all grades of fuel	109,419,521	113,386,020
Refinable crude, 20° A. P. I., and lighter	42,744,491	41,469,458
Gasoline	17,241,334	16,530,593
Naphtha distillates	2,937,081	2,622,395
All other stocks	8,690,714	10,808,853
Total all stocks	181,033,141	184,817,319

Utilization of California's Crude Oil.

Most of the crude oil produced in California is sent to storage reservoirs at the tank farms near the oilfields and from these reservoirs by pipe line to the refineries, the larger ones of which are located in the vicinity of Los Angeles or on San Francisco Bay.

During 1930 the crude oil consumed in California, according to the U. S. Bureau of Mines [2] was 204,877,472 barrels sent to the stills at the refineries; 7,144,706 barrels to foreign shipments; and 18,718,641 barrels were either consumed as fuel, added to heavy crude stock or lost.

The production of petroleum products during 1930 is shown in Table F.

TABLE F

Commodity	*Amount in barrels*
Crude oil	228,099,899
Gas and fuel oils including heavy crude, below 20°	[a] 133,020,816
Natural gasoline	19,650,690
Gasoline and engine distillate	84,312,752
Kerosene	6,288,288
Lubricants	2,513,060
Asphalt	2,660,725
Coke	132,527
Road oil	1,579,416
All other finished	1,449,694
Total	[b] 247,750,589

[a] Includes 18,718,641 barrels of crude oil used as fuel or added to stocks of heavy crude.

[b] Total of crude oil and natural gasoline production.

Operating Data.

The following tabulation (Table G) is compiled from data published by the Department of Petroleum and Gas,[3] semiannually, and here combined to show the entire year's operations for all fields. The districts are the geographical subdivisions as administered by the Department, and which are outlined on the accompanying map.

[1] Standard Oil Bulletin, February, 1931, p. 14.

[2] Knudsen, E. T., Statistical Summary of the California Petroleum Industry, 1930; U. S. Bureau of Mines, 1931, pp. 2, 3.

[3] Summary of Operations, California Oil Fields; Division of Oil and Gas, Fifteenth Annual Report of State Oil and Gas Supervisor, Vol. 16, No. 1, July, Aug., Sept., 1930, and No. 3, Jan., Feb., March, 1931.

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It will be noted that the state average yield of oil per well per day was 73.7 barrels for the first six months of 1930 and 68.4 barrels for the second. This is somewhat higher than the figure of 66.1 barrels average for December derived from American Petroleum Institute data as shown in Table D, on a previous page, due in part at least, to the fact that the latter is on a full-time basis, whereas the Bureau figures allow for shut-down time.

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TABLE G. Production Statistics and Operating Data of California Oil Fields—1930

Field	January 1 to June 30						July 1 to December 31					
	Average number of producing wells—actual	Oil (bbls.)	Number of days producing	Production per well per day (bbls.)		Percentage of time wells produced	Average number of producing wells—actual	Oil (bbls.)	Number of days producing	Production per well per day (bbls.)		Percentage of time wells produced
				Oil	Water					Oil	Water	
Dist. 1—Beverly Hills	13	65,741	2,180	30.2	21.8	92.6	13	64,715	2,234	29.0	21.1	93.4
Brea-Olinda	372	2,321,773	63,863	36.4	16.0	94.8	369	2,088,800	62,066	33.7	17.1	91.4
Coyote Hills	192	1,941,731	33,386	58.2	40.7	96.1	189	1,905,321	33,122	57.5	40.8	95.2
Dominguez	58	1,851,895	9,866	187.7	79.6	94.0	56	1,846,157	9,844	187.5	81.0	95.5
Huntington Beach*	501	5,882,735	79,151	74.3	49.0	87.3	455	5,327,726	74,002	72.0	58.0	88.4
Inglewood	226	3,428,385	39,396	87.0	39.5	96.3	213	3,020,707	37,198	81.2	40.6	94.9
Lawndale	6	83,188	1,065	78.1	17.7	98.1	6	55,167	858	64.3	16.4	77.7
Long Beach*	816	18,578,045	126,516	146.8	63.5	85.7	854	18,194,863	139,483	130.4	64.2	88.8
Montebello	194	1,372,551	32,751	41.9	79.0	93.3	188	1,321,566	32,501	40.7	77.4	94.0
Newhall	55	90,221	9,887	9.1	2.0	99.3	59	92,842	10,286	9.0	2.1	94.7
Newport	3	5,040	522	9.7	0.6	96.1	3	4,079	540	7.6	0.4	97.8
Playa del Rey*	2	264,832	236	1,122.2	61.2	65.2	67	4,201,871	9,931	423.1	51.2	80.6
Potrero	9	208,404	1,320	157.9	56.4	81.0	12	322,808	2,075	155.6	39.3	94.0
Richfield*	255	2,019,212	38,088	53.0	11.1	82.5	216	1,617,403	29,626	54.6	13.1	74.5
Rosecrans	98	1,196,741	17,033	70.3	56.2	96.0	102	1,200,707	17,824	67.4	52.8	95.0
Salt Lake	77	147,635	13,681	10.8	17.2	98.2	61	138,230	10,443	13.3	21.7	93.0
Santa Fe Springs	438	25,693,768	63,646	403.7	65.1	80.3	507	18,344,091	82,675	221.9	63.8	88.6
Seal Beach	137	4,509,206	22,622	199.3	129.2	91.2	129	3,436,006	21,556	159.1	129.3	90.8
Torrance*	585	2,187,468	100,192	21.8	4.5	94.6	559	1,957,431	94,196	20.8	3.5	91.6
Whittier	174	258,019	30,920	8.3	28.5	98.2	172	256,936	31,200	8.2	28.7	98.6
Totals	4,211	72,106,590	686,321	105.1	42.9	90.0	4,230	65,392,426	701,660	93.2	45.6	90.2
Dist. 2—Bardsdale	107	115,599	19,276	6.0	1.3	99.5	117	113,693	20,681	5.5	1.3	96.1
Conejo	0	0	0	0	0	0	0	0	0	0	0	0
Ojai	21	12,908	3,368	3.8	.5	88.6	22	15,025	4,025	3.7	0.1	99.4
Piru	96	72,084	14,666	4.9	2.6	84.4	97	89,138	13,936	6.4	2.8	78.1
Rincon	34	539,090	5,560	97.0	22.9	90.3	33	459,847	5,616	81.9	31.9	92.5
Santa Paula	21	11,244	2,541	4.4	1.3	66.9	23	11,870	2,996	4.0	2.4	70.8
Sespe	26	22,623	3,663	6.2	.1	77.8	23	20,582	3,190	6.5	0.3	75.4
Simi	51	20,719	7,851	2.6	1.1	85.1	53	22,980	9,054	2.5	1.1	92.8
South Mountain	81	547,086	13,255	41.3	.7	90.4	79	500,297	12,934	38.5	0.7	89.3
Ventura	175	8,848,202	27,123	326.2	48.3	85.6	173	8,560,354	26,967	317.4	45.8	84.7
Totals	612	10,189,555	97,303	104.7	15.7	87.8	620	9,793,786	99,449	98.5	15.2	87.2
Dist. 3—Arroyo Grande	8	18,528	1,323	14.0	3.3	91.4	15	25,967	2,442	10.6	10.0	88.5
Casmalia[1]	8	9,799	1,467	6.7	4.0	97.3	7	9,025	1,226	7.4	88.5	95.2
Cat Canyon	33	232,490	5,414	42.9	11.4	90.6	21	151,447	3,300	45.9	19.5	85.4
Elwood	29	7,511,721	5,045	1,488.9	66.3	96.1	47	7,106,021	7,461	952.4	56.2	86.3
Lompoc	3	17,705	112	158.1	12.6	20.6	2	16,235	70	231.9	21.1	19.0
Santa Maria	134	363,109	17,404	20.9	45.1	71.8	123	346,750	16,181	21.4	43.4	71.5
Summerland	62	57,460	10,016	5.3	4.8	97.3	52	39,316	9,273	4.2	3.9	99.9

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Santa Barbara County—												
El Capitan District	2	8,632	144	59.9	4.1	39.8	2	17,886	135	132.5	0.4	36.7
Mesa District	1	1,479	99	14.9	149.0	54.7	1	24,774	134	184.9	0	72.8
More Ranch District[2]	1	283	9	31.4	3.0	5.0	1	0	0	0	0	0
San Luis Obispo County—												
Huasna District	1	1,744	181	9.6	20.0	100.0	1	1,698	184	9.2	20.0	100.0
Totals	282	8,222,950	42,114	195.3	30.0	82.5	272	7,739,119	40,406	191.5	33.8	80.7
DIST. 4—Belridge	150	370,624	24,740	15.0	9.8	91.1	154	630,644	26,793	25.4	8.2	94.6
Elk Hills	231	3,333,751	39,239	85.0	46.5	93.8	232	3,221,473	39,603	81.3	54.7	92.8
Fruitvale	17	459,066	2,837	161.8	4.4	92.2	18	456,831	3,042	150.2	5.4	91.8
Kern River	942	2,922,764	158,644	18.4	19.4	93.0	923	2,284,849	154,874	14.8	10.3	91.2
Lost Hills	93	222,614	15,130	14.7	32.3	89.9	38	63,269	5,891	10.7	19.1	84.3
McKittrick-Temblor	262	751,722	44,298	17.0	63.2	93.4	246	692,500	43,222	16.0	61.5	95.5
Midway-Sunset	2,036	12,287,212	337,317	36.4	19.9	91.5	1,955	11,134,745	329,407	33.8	21.1	91.6
Mt. Poso	83	2,125,846	11,069	192.1	9.6	73.7	76	1,740,597	10,889	159.8	23.4	77.9
Round Mountain	19	601,485	2,950	203.9	7.8	85.8	23	599,147	3,458	173.3	11.9	81.7
Wheeler Ridge	34	110,552	5,977	18.5	2.8	97.1	35	108,685	6,211	17.5	3.0	96.4
WILDCAT												
Kern County—												
East Side	0	0	0	0	0	0	1	279	1	279.0	36.0	0
West Side	0	0	0	0	0	0	1	2,155	35	61.6	18.1	0
Tulare County	0	0	0	0	0	0	2	2,820	233	12.1	91.4	0
Totals	3,867	23,185,636	642,201	36.1	23.8	91.8	3,704	20,987,994	623,659	33.7	22.5	91.5
DIST. 5—Coalinga	744	1,676,855	129,784	12.9	11.7	96.4	740	1,686,047	131,016	12.9	11.8	96.2
Kettleman Hills	5	2,476,888	864	2,866.8	70.3	95.5	8	3,699,242	1,359	2,722.0	57.9	92.3
Totals	749	4,153,743	130,648	31.8	12.1	96.4	748	5,385,289	132,375	40.7	12.2	96.2
Grand totals	9,721	117,858,474	1,598,587	73.7	30.7	90.9	9,574	109,298,614	1,597,549	68.4	31.6	90.7
*The exact production for some wells could not be obtained and the following estimates were incorporated in the above figures:												
DIST. 1—Huntington Beach	3	18,375	270				4	21,353	684			
Long Beach	4	80,500	640				4	68,716	697			
Richfield	1	1,530	180				0	0	0			
Playa del Rey	0	0	0				15	666,762	2,099			
Torrance	0	0	0				2	2,349	226			

[1] Nine wells produced for ten months.
[2] First production, February, 1930.
NOTE—Devils Den Field—last date of production, July, 1927.

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CHAPTER THREE

METALS

Bibliography: Reports of State Mineralogist I–XXVI (inc.). Bulletins 5, 6, 18, 23, 27, 36, 50, 57, 76, 78, 85, 92, 95. Spurr and Wormser, "Marketing of Metals and Minerals." See also under each metal.

The total value of metals produced in California during 1930 was $15,048,229. Chief among these is and always has been gold; followed by copper, quicksilver, tungsten, lead, platinum, manganese and iron ore.

There was no production of antimony, arsenic, cadmium, molybdenum, titanium, nor zinc, which have in the past been on the active list. Deposits of ores of nickel and vanadium have also been found in the state, although there has yet been no commercial output of them. The above-noted total of this group is a net decrease of $1,461,469 from the 1929 total of $16,509,698. Copper showed the largest decline in production.

California leads all states in the Union in her gold production and is credited with approximately 20% of the nation's yield in 1930. The precious metal is widely distributed through the state. Thirty-four of the fifty-eight counties reported an output in 1930 from either mines or dredges.

Copper, which is second in importance among the metals of the state, occurs in the following general districts: the Shasta County belt, which has been by far the most important; the Coast Range deposits, extending more or less continuously from Del Norte in the north to San Luis Obispo County in the south; the Sierra Nevada belt, starting in Plumas and running in a general southerly and southeasterly direction through the Mother Lode counties and ending in Kern; the eastern belt in Mono and Inyo counties, and the southern belt in San Bernardino, Riverside and San Diego counties.

Silver is not generally found alone in the state, except notably in the Rand district, San Bernardino County; but is associated to a greater or less extent with gold, copper, lead and zinc.

Quicksilver has for many years been one of the state's staple products and California in 1930 supplied approximately 53% of the nation's output of this metal.

Tungsten is found in but few other localities of importance in the United States.

Large deposits of iron ore have long been known in several sections of the state, but for various economic reasons this branch of the mineral industry thus far has made only slight progress on the Pacific Coast.

Titanium is associated with some of California's iron deposits. This mineral is widely distributed through the United States, but the deposits of this state are among the few that are considered of commercial importance.

Although the United States is a large consumer of certain metals, in fact the largest particularly of chromium and tin, our production from

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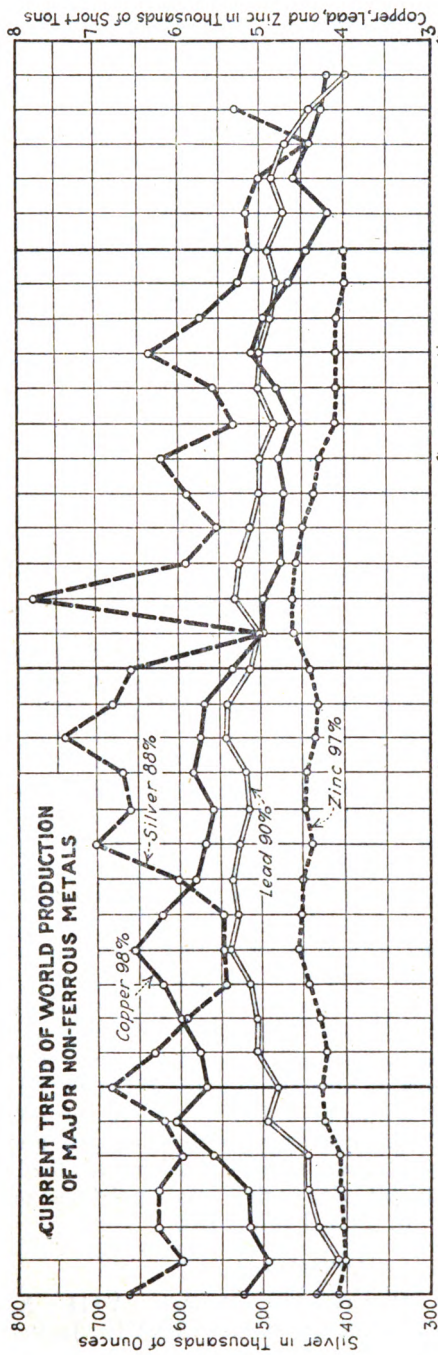

These curves are not to be considered as permanent records of production. They show merely the current trend in terms of daily output, according to the latest estimates of the American Bureau of Metal Statistics.

From Engineering and Mining Journal, July 13, 1931.

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domestic sources is deficient. We have large reserves of low-grade chromite, manganese, tungsten and antimony ores, but they do not fully supply our commercial needs.

A comparison of the 1930 output with that of the 1929 is afforded by the following table:

Substance	1929		1930		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Copper	33,809,258 lbs.	$5,941,799	26,534,752 lbs.	$3,449,522	$2,492,277—
Gold		8,526,703		9,451,162	924,459+
Lead	1,428,777 lbs.	90,014	3,524,796 lbs.	176,241	86,227+
Platinum	213 fine oz.	14,316	217 fine oz.	11,700	2,716—
Quicksilver	10,152 flasks	1,195,705	11,374 flasks	1,255,257	59,552+
Silver	1,176,895 fine oz.	627,285	1,622,803 fine oz.	624,779	2,506—
Tungsten	150 tons	106,280	*	*	* —
Unapportioned		[a] 7,496		[b] 79,568	72,072+
Total value		$16,509,698		$15,048,229	
Net decrease					$1,461,469

*Under "unapportioned."
[a] Includes manganese ore and tin.
[b] Includes iron ore, manganese ore and tungsten.

ALUMINUM

Bibliography: Report XVIII, p. 198. Bulletins 38, 67. U. S. Geol. Surv., Min. Res. of U. S.

To date there has been no commercial production of aluminum ore in California. Only a single authenticated occurrence of bauxite has thus far been noted in this state, being in Riverside County, southeast of Corona, but as yet undeveloped.

Minerals containing aluminum are abundant, the most widely distributed being the clays. There are only two, however, thus far of consequence commercially, in the production of the metal: bauxite (to which may be added the related hydrated oxides, hydrargillite and diaspore) and cryolite. Cryolite is found in commercial quantities only in south Greenland, and was formerly the only ore of aluminum used, being still employed as a flux in the extraction of the metal. Bauxite has been for some years the most important source of aluminum and its salts. Its color varies from gray to red, according to the amount of iron present, the composition ranging usually between the following limits: Al_2O_3, 30%–60%; Fe_2O_3, 3%–25%; SiO_2, 0.5%–20%; TiO_2, 0.0–10%. Besides its reduction to the metal bauxite is also utilized in the manufacture of aluminum salts, refractory bricks, alundum (fused alumina) for use as an abrasive, and in the refining of oil. The most important producing countries, both of bauxite and the metal, are the United States and France. The United States leads with 36% of world's output of the metal, although France produces more bauxite than any other country. In 1913 France led.

ANTIMONY

Bibliography: State Mineralogist Reports VIII, X, XII–XV (inc.), XVII, XXII, XXIII, XXV, XXVI. Bulletins 38, 91.

During 1930 there were no shipments of antimony ore in California although there was a small amount mined in Kern County. The last

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commercial production was made in 1928 when 20 tons of ore, calculated at 45% antimony, valued at $761 and coming from properties in Kern and San Bernardino counties, was shipped to a plant in Los Angeles for smelting.

Production of antimony in California has been irregular, and small in amount except during 1915–17 when the high war-time prices permitted American producers, for a short period, to compete with Chinese antimony. The principal commercial production of antimony in California has come from Kern, Inyo and San Benito counties, and other occurrences have been noted in Nevada, Riverside, San Bernardino and Santa Clara counties. The commonest occurrence is in the form of the sulphide, stibnite; but in the Kernville and Havilah districts in Kern County there were notable deposits of the native metal, being among the few localities of the world where native antimony has been found.

California producers claim they can not operate profitably unless the price of antimony be above 12 cents per pound. During most of 1925 and 1926 the price was up, at times as high as 23¢, and as a consequence there was some revival of antimony mining in California. Present New York quotations (July 31, 1931) are around $6\frac{3}{4}$¢ per pound for Chinese brands. China is the principal world source of antimony.

The antimony market (New York being the chief center) is recognized as one of the most unstable of the metal markets. As the world's requirements for antimony are comparatively small, the prices react sharply if an extra quantity of the metal be thrown onto the market, and the trade becomes so cautious that the market may disappear altogether, causing production to fall off rapidly.

Pure antimony metal and manufactured antimony compounds are of considerable importance as pigments in the ceramic industry. The most important use of the metal, commercially, is in various alloys, particularly type-metal (with tin and lead), babbitt (with tin and copper), and britannia metal (with tin and copper). An alloy of 6% antimony and 94% lead is being extensively used in making battery plates for storage batteries for automobiles, airplanes and radio apparatus.

Antimony Production in California, by Years.

The production of antimony ore in California by years since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	75	$15,500	1902		
1888	100	20,000	1915	510	$35,666
1889			1916	1,015	64,793
1893	50	2,250	1917	158	18,786
1894	150	6,000	1918		
1895	33	1,485	1925	*26	770
1896	17	2,320	1926		
1897	20	3,500	1927	20	590
1898	40	1,200	1928	20	761
1899	75	13,500	1929		
1900	70	5,700			
1901	50	8,350	Totals	2,429	$201,171

* Annual details concealed under 'Unapportioned.'

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ARSENIC

Bibliography: Reports XVIII, XXIII, XXV. Bulletin 67, U. S. G. S., Min. Res. of U. S.

Arsenic is found in a number of localities in California in the mineral arsenopyrite (FeAsS), which is frequently gold bearing; and in scorodite ($FeAso_4+2H_2O$), an oxidation product of arsenopyrite. The occurrence of realgar (AsS) has also been noted. The principal source of the arsenic of commerce in the United States has been as a by-product from the metallurgical treatment of copper, gold, and lead ores. It is usually recovered in the form of the tri-oxide, or 'white arsenic,' for which there is a demand for the preparation of insecticides, for use in agriculture and horticulture, and especially against the cotton-boll weevil in the southern states.

During the year there was some activity in opening up an arsenic mine at Lake Hodges in San Diego County, but as yet there has been no shipment or production.

Except for a small output in 1924, there has been no commercial recovery of arsenic from Californian ores. There having been only a single operator, the figures are concealed under the 'Unapportioned' item.

BERYLLIUM

Bibliography: State Mineralogist Report XXVII. Eng. & Min. Jour.-Press, Vol. 118, No. 8, p. 285, Aug. 23, 1924. U. S. Bureau of Mines Information Circular 6190.

Beryllium is a metal resembling aluminum closely in its chemical character. It has a specific gravity of 1.85, is almost as hard as quartz (will scratch glass) and will take a high polish. The use of beryllium as a metal is still more or less in the experimental stage because the cost of extracting the metal from its ores almost makes it prohibitive and the present sources of supply of the ore are limited. Not until such a time when deposits can be found that will assure a definite supply and metallurgical costs are such as to justify its use, will the metal be found in common use.

There has been some talk about the use of beryllium as a metal in airplane construction, although little has been done so far. Several alloys of beryllium have been made and tested successfully. The addition of 2% to 3% of the metal to copper and nickel makes a bronze that has the strength and hardness of carbon steel and resists corrosion. Copper with 1.3% beryllium is an alloy with a gold color and sonorous. When small percentages of beryllium are alloyed with aluminum, copper, iron or nickel, it increases their hardness and strength. Beryllium has been utilized in X-ray apparatus and for electrodes in neon signs.

Compounds of beryllium at present used commercially are the nitrate and the oxide. The nitrate is used by incandescent mantle manufacturers to harden the thorium oxide skeleton, and the oxide has been added to materials being used for the manufacture of abrasive compounds and in dental cements. Beryllium sulphate has been used to some extent in medical research. Experiments of the use of the oxide

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in various glasses show that it gives a harder and more refractory glass than calcium or magnesium.

There are a number of beryllium minerals, but none have been found in commercial quantities, except beryl, which is a beryllium-aluminum silicate. The chief use at present for ground beryl is as an addition to porcelain products, where it reduces the coefficient of expansion. Beryllium metal is difficult to separate from aluminum.

Beryl occurs in California in the pegmatite dikes of the tourmaline gem district in northern San Diego and southwestern Riverside counties. Thus far there have been no commercial shipments of beryl except for gem purposes (the pink and aquamarine varieties).

BISMUTH

Bibliography: Bulletins 38, 67, 91. Am. Jour. Sci., 1903, Vol. 16.

Several bismuth minerals have been found in California, notably native bismuth and bismite (the ochre) in the tourmaline gem district in San Diego and Riverside counties near Pala. Other occurrences of bismuth minerals, including the sulphide, bismuthinite, have been noted in Inyo, Fresno, Nevada, Tuolumne, San Bernardino, and Mono counties, but only in small quantities. The only commercial production recorded was 20 tons valued at $2,400, in 1904, and credited to Riverside County. Recovery of bismuth from blister copper in the electrolytic refinery has been noted. In the United States, the principal recovery of bismuth is obtained as a by-product from the refining of lead bullion.

The uses of bismuth are somewhat restricted, being employed principally in the preparation of medicinal salts, and in low melting-point or cliché alloys. These alloys are utilized in automatic fire sprinkler systems in electric fuses, and in solders.

Present quotations for bismuth are around $1.50 per pound, in ton lots for the refined metal.

CADMIUM

Bibliography: U. S. Geol. Surv., Min. Res. of U. S., 1908, 1918.

During 1917 and 1918, cadmium metal was recovered by the electrolytic zinc plant of the Mammoth Copper Company in Shasta County It was shipped in the form of 'sticks' and amounted to a total of several thousand pounds for the two years, the exact figures being concealed under 'Unapportioned.' That was the first, and thus far the only, commercial production of cadmium recorded from California ore. Cadmium occurs there associated with zinc sulphide, sphalerite. Cadmium also occurs in the Cerro Gordo Mine, Inyo County, associated with smithsonite (zinc carbonate).

There are several cadmium minerals, but none of them occur in sufficient quantities individually to be profitable as distinct ores. The cadmium of commerce is derived as a by-product in the reduction of zinc minerals and ores, in nearly all of which it occurs in at least minute proportions, the average ratio being about 1 of cadmium to 200 of zinc. As cadmium behaves metallurgically much the same as zinc, it constitutes a fraction of 1 per cent of nearly all metallic zinc.

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Cadmium is produced in the United States in two forms—metallic cadmium and the pigment, cadmium sulphide. The principal use of the metal is in low-melting point, or cliché alloys, and its salts are utilized in the arts, medicine, and in electroplating. The sulphide is employed as a paint pigment, being a strong yellow, which is unaffected by hydrogen sulphide gas from coal smoke. It is also employed in coloring glass and porcelain. Cadmium cliché metal is stated to be superior to the corresponding bismuth alloy, for making stereotype plates. Cadmium is also used in bronze telegraph and telephone wires, and gives some promise of being utilized in electroplating.

Present quotations for cadmium are 55¢ per pound for the refined metal.

COBALT

Bibliography: Report XIV. Bulletins 67, 91. U. S. G. S., Min. Res. of U. S., 1912, 1918. U. S. B. M., I. C. 6331.

Occurrences of some of the cobalt minerals have been noted in several localities in California, but to date no commercial production has resulted. Some of the copper ores of the foothill copper belt in Mariposa and Madera counties have been found to contain cobalt up to 3%. The most notable occurrence thus far found in this State is in the Mar-John Mine near Sheep Ranch, Calaveras County. Lenses of smaltite ($CoAs_2$), have been uncovered in the vein, there, and several tons taken out in the course of development work; but as yet there have been no commercial shipments.

The most important use of cobalt is in the manufacture of the alloy, stellite, in which it is combined with chromium, for making high-speed lathe tools, and non-tarnishing cutlery and surgeons' appliances. The metal is also used in electroplating, similarly to nickel; and the oxide, carbonate, chloride, sulphate and other salts are used in ceramics for coloring. Some of the organic salts of cobalt (acetate, resinate, oleate) are employed as 'driers' in paint and varnish.

The nominal quotation for cobalt is around $2.50 per pound for the refined metal.

COPPER

Bibliography: State Mineralogist Reports VIII–XXVII (inc.). Bulletins 23, 50, 91.

Copper is second to gold among the metals mined in California. The output during 1930 amounted to a total of 26,534,752 pounds recoverable metal valued at $3,449,522. This was a decrease in both amount and value from the 1929 figures which were 33,809,258 pounds and $5,941,799. The average price of copper for 1930 was 13 cents per pound compared with 17.6 cents a pound in 1929 and 14.4 cents in 1928.

Plumas County ranked first, as it has for several years past, in the production of copper for 1930, with an output of 19,529,224 pounds. Shasta County came second with 3,962,383 pounds and Calaveras County third with 1,857,248 pounds.

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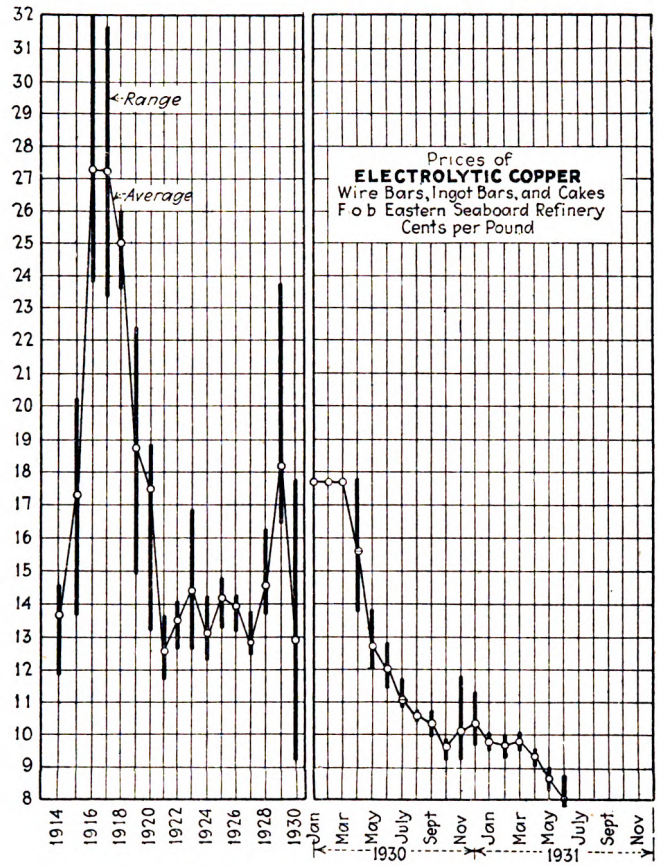

From Engineering and Mining Journal, July 13, 1931.

Distribution of the 1930 copper output in California by counties was as follows:

County	*Pounds*	*Value*
Butte	353	$46
Calaveras	1,857,248	241,442
Inyo	19,607	2,549
Mariposa	3,629	472
Mono	2,006	261
Napa	9,257	1,203
Nevada	17,009	2,211
Plumas	19,529,224	2,538,799
Riverside	5,878	764
San Bernardino	40,622	5,281
Shasta	3,962,383	515,110
Siskiyou	405,868	52,763
Trinity	588,574	76,514
Tuolumne	4,566	593
Alameda, Amador, Humboldt, Kern, Madera, Placer, Sierra*	88,528	11,514
Totals	26,534,752	$3,449,522

* Combined to conceal the output of a single operator in each.

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Copper Production of the United States.

According to preliminary data issued by the U. S. Bureau of Mines,[1] the smelter production of primary copper from domestic sources during 1930 amounted to 1,394,389,327 pounds, a decrease of approximately 30 per cent compared with 1929 output. The value decreased approximately 49 per cent in 1930. The average price of 2,447,540,000 pounds of copper delivered during the year, as reported to the U. S. Bureau of Mines by selling agents, was 13 cents per pound.

REFINED COPPER

The total production of new refined copper in 1930 was 2,157,000,000 pounds, a decrease of 583,000,000 pounds from that in 1929.

Primary and secondary copper produced by regular refining plants and imported, 1929–1930, in pounds

	1929	*1930*
Primary:		
Domestic:[1]		
Electrolytic	1,785,754,654	1,228,416,733
Lake	185,300,917	142,985,522
Casting	11,676,718	19,821,950
	1,982,732,289	1,391,224,205
Foreign:[1]		
Electrolytic	756,555,087	765,189,037
Casting	825,000	645,936
Refinery production of new copper	2,740,112,376	2,157,059,178
Imports of refined copper	134,014,792	86,210,331
Total new refined copper made available	2,874,127,168	2,243,269,509
Secondary:		
Electrolytic	331,858,103	279,423,370
Casting	2,300,000	1,106,114
	334,158,103	280,529,484
	3,208,285,271	2,523,798,993

[1] The separation of refined copper into metal of domestic and foreign origin is only approximate, as an accurate separation of the amounts at this stage of manufacture is not possible.

In addition to their output of metallic copper the regular refining companies produced bluestone (hydrous copper sulphate) having a copper content of 9,419,000 pounds, as compared with 10,255,000 pounds in 1929.

STOCKS

Stocks in copper January 1, 1926, 1927, 1928, 1929, 1930 and 1931, in pounds

Year	*Refined copper*	*Blister and material in process of refining*[1]
1926	124,000,000	432,000,000
1927	146,000,000	455,000,000
1928	171,000,000	401,000,000
1929	114,000,000	423,000,000
1930	306,000,000	500,000,000
1931	615,000,000	450,000,000

[1] The amounts stated in the last column in the table above do not include copper in stock at foreign smelters or in transit from foreign smelters to refineries in the United States.

CONSUMPTION

The new refined copper withdrawn from the total year's supply on domestic account in the United States in 1930 and the method employed in determining it are shown in the following table, which does not include stocks of copper held by consumers.

[1] U. S. Bureau of Mines, Press Bulletin, June 2, 1930.

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New refined copper withdrawn from total year's supply on domestic account, 1929–1930, in pounds

	1929	1930
Total supply of new copper	2,874,127,168	2,243,269,509
Stock at beginning of year	114,000,000	306,000,000
Total available supply	2,988,127,168	2,549,269,509
Copper exported [1]	903,541,753	669,252,807
Stock at end of the year	306,000,000	615,000,000
	1,209,541,753	1,284,252,807
Withdrawn on domestic account	1,778,585,415	1,265,016,702

[1] Includes refined copper in ingots, bars, rods, or other forms.

Copper Production of California, by Years.

Although some mining of copper ores in a small way had been done earlier, shipments in appreciable quantities began in 1861 and continued of importance up to the end of 1867, when a total of 68,631 tons (of 2376 pounds) of high-grade ores, and 847 tons of matte or 'regulus'[1] had been shipped to smelters at New York, Boston, and Swansea, Wales. The most important district at that time was Copperopolis and vicinity in Calaveras County, with some shipments also made from Mariposa, El Dorado, Fresno and San Luis Obispo counties. From 1868 to 1882, the output was insignificant. There are wide discrepancies in the figures currently recorded for copper production previous to 1882, in which year the data of the U. S. Geological Survey began. The detailed statistics of the California State Mining Bureau began in the year 1894.

Amount and value of copper production in California annually since 1882 is given in the following tabulation:

Copper Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1882	826,695	$144,672	1908	40,868,772	$5,350,777
1883	1,600,862	265,743	1909	65,727,736	8,478,142
1884	876,166	120,911	1910	53,721,032	6,680,641
1885	469,028	49,248	1911	36,838,024	4,604,753
1886	430,210	43,021	1912	34,169,997	5,638,049
1887	1,600,000	192,000	1913	34,471,118	5,343,023
1888	1,570,021	235,303	1914	30,491,535	4,055,375
1889	151,505	18,180	1915	40,968,966	7,169,567
1890	23,347	3,502	1916	55,809,019	13,729,017
1891	3,397,405	424,675	1917	48,534,611	13,249,948
1892	2,980,944	342,808	1918	47,793,046	11,805,883
1893	239,682	21,571	1919	22,162,605	4,122,246
1894	738,594	72,486	1920	12,947,299	2,382,303
1895	225,650	21,901	1921	12,088,053	1,559,358
1896	1,992,844	199,519	1922	22,883,987	3,090,582
1897	13,638,626	1,540,666	1923	28,346,860	4,166,989
1898	21,543,229	2,475,168	1924	52,089,349	6,823,704
1899	23,915,486	3,990,534	1925	46,968,499	6,669,527
1900	29,515,512	4,748,242	1926	33,521,544	4,693,014
1901	34,931,788	5,501,782	1927	27,350,316	3,582,888
1902	27,860,162	3,239,975	1928	25,162,304	3,623,360
1903	19,113,861	2,520,997	1929	33,809,258	5,941,799
1904	29,974,154	3,969,995	1930	26,534,752	3,449,522
1905	16,997,489	2,650,605			
1906	28,726,448	5,522,712	Totals	1,129,201,335	$180,868,070
1907	32,602,945	6,341,387			

[1] Brown, J. Ross, Mineral Resources West of the Rocky Mountains, p. 168, 1867.

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GOLD

Bibliography: State Mineralogist Reports I to XXVII (inc.), (except III and VIII). Bulletins 36, 45, 57, 91, 92, 95. U. S. Geol. Surv., Prof. Paper 73.

Gold was the first, and, for many years, the most important single mineral product of California. Although now surpassed for a number of years in annual value by petroleum, and by cement beginning with 1920, it still heads our metal list, and California continues to outrank all the other gold-producing states of the United States, including Alaska. In fact, at present, California is producing approximately 20% of the gold mined in the entire United States.

The gold yield has decreased in recent years, not only in California but in the country as a whole. Meanwhile, the actual gold reserves

Hydraulicking at the Canyon Creek Placer Mine, near Dedrick, Trinity County.
—*Photo by Walter W. Bradley*

(monetary stock on hand) of the United States has increased to such an extent that we now hold practically one-half of the world's stock.

There has been a renewal in the development of both lode and placer gold properties in California during the last two years. This is shown in the number of mines worked. There were 480 lode properties and 892 placers operating in 1930, as compared with 324 lodes and 478 placers in 1929.

The production of gold in California during 1930 totaled 457,199.98 fine ounces worth $9,451,162, being an increase of 44,720.73 fine ounces over the 1929 yield. The deep or lode mines output accounted for $5,696,019 and the placers (mainly the dredges) produced $3,755,143.

As the Division of Mines has never independently gathered the statistics of gold and silver production, these figures, as in former years,

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are published by cooperation with and through the courtesy of Mr. V. C. Heikes of the Division of Minerals and Statistics, U. S. Bureau of Mines.

The largest gold production for 1930 is reported from Nevada County, with an output of 106,109.87 fine ounces ($2,193,486); Amador County second with 89,019.24 fine ounces ($1,840,191); Sacramento County third with 83,432.95 fine ounces ($1,724,712); followed in turn by Yuba, Sierra, Plumas, Trinity, Shasta. It will be noted that the four leading counties held the same order that they did in 1929; with Nevada holding first place as a gold producing county with an output exceeding that of Yuba or Amador, which held first and second places respectively in 1928 with Sacramento fourth that year. The gold from Yuba and Sacramento comes almost entirely from dredges, while that from Nevada and Amador counties comes mainly from the lode mines.

Distribution of the 1930 gold output by counties was as follows:

County	Number of producers		Value
	Lode	Placer	
Amador	23	9	$1,840,191
Butte	11	78	126,858
Calaveras	30	27	112,913
Contra Costa	1	---	102,036
Del Norte	---	2	279
Eldorado	35	28	78,019
Fresno	2	2	5,916
Humboldt	4	7	2,255
Imperial	---	1	148
Inyo	22	1	20,466
Kern	35	4	165,435
Lassen	4	---	2,946
Madera	4	3	1,062
Mariposa	24	27	58,985
Merced	---	1	88,328
Mono	7	---	26,234
Napa	1	---	36,532
Nevada	65	83	2,193,486
Placer	4	97	29,338
Plumas	13	103	405,359
Riverside	8	---	4,833
Sacramento	2	14	1,724,712
San Bernardino	48	8	59,442
San Diego	6	---	2,234
San Luis Obispo	---	1	1,461
Shasta	24	69	226,214
Sierra	17	46	589,249
Siskiyou	21	107	70,332
Stanislaus	---	5	109,134
Trinity	13	88	330,003
Tulare	2	---	36
Tuolumne	49	16	67,691
Ventura	1	---	221
Yuba	3	66	968,614
Total, 1930	480	892	$9,451,162
Total, 1929	324	478	$8,526,703

The following is quoted from the advanced statement of gold in 1930 by courtesy of the U. S. Bureau of Mines,[a] Department of Commerce:

"The total recoverable gold in ore and gravels treated in California in 1930, according to Victor C. Heikes of the U. S. Bureau of Mines, was valued at $9,451,162, of which 481 lode operations yielded $5,696,019 and 892 placer operations (including dredges) $3,755,143. Compared with the gold yield in 1929 this was an increase of $924,459, with the lode mines showing an increase of $1,039,923 and the placer mines a decrease of $115,464. Of the total gold yield in 1930, lode operations yielded 60 per cent and placer operations 40 per cent. Only 3 counties had a production of gold exceeding $1,000,000 and these were, in order of rank, Nevada, Amador and Sacramento; Yuba, Sierra and Plumas followed next in order of rank. Of the lode gold output gold ore and tailings yielded 90 per cent, copper ore, etc., 7 per cent, and

[a] U. S. Bureau of Mines, Department of Commerce advanced statement for 1930 and Press Bull. Jan. 2, 1931.

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silver ore 1 per cent. Of the placer gold output dredges yielded 92 per cent, surface placers 4 per cent, drift placers 2 per cent, and hydraulic placers 2 per cent. The gold output of 24 dredges (25 in 1929, including a small experimental dredge) was 4 per cent less than in the preceding year. Twenty-eight companies in the State produce more than 1000 ounces of gold each and contributed 90 per cent of the total gold output. The largest producers of gold were the Empire Star Mines Co. (Ltd.), Natomas Company, Yuba Consolidated Gold Yields, Kennedy Mining and Milling Co., Argonaut Mining Co., Original Sixteen to One Mine (Inc.), Central Eureka Mining Co., Capital Dredging Co., Walker Mining Co., and Idaho Maryland Mines Co."

"In Nevada County the Empire Star Mines Co. developed a new vein with encouraging results. At the North Star mines a leading system was inaugurated and the North Star was equipped with flotation machines for testing oxidized ores and current tailing from the Empire plant. An aerial tram, which carries the North Star ore to the Empire mill, now connects the two properties. The Pennsylvania tram line handles waste from the Empire mine and also carries ore from the Pennsylvania shaft to the Empire mill. At the Idaho Maryland, development was continued with encouraging results and enlarged milling facilities were planned. Reconditioning of the Brunswick mill on an adjoining property was under way in order to provide for the increase in milling. The American Foundation Co., operating the Murchie gold mine, increased the capacity of its flotation mill and the gold production was increased. Development of the Hoge, Grass Valley-Boreham, Queen Lil, and other gold properties in the Grass Valley-Nevada City district continued. In Amador County with the Kennedy mine and mill again on an active operating basis and the Argonaut taking on new life from ore developed on the 5500-foot level, the production of gold in the Jackson district will show an increase compared with the 1929 output. The Central Eureka, however, did not come up to its usual production and the Moore mine was inactive. The custom cyanide plant of the Amador Metals & Reduction Co. was operating without interruption on tailing and concentrates. In the Lancha Plana district the dredge operating on the Amador County side of the Mokelumne River had an increased gold yield. Mining of the Iron Mountain gossan deposit in Shasta County by the Mountain Copper Co. was actively carried on and about 8000 tons of gold ore was treated monthly by cyanidation. Capacity of the mill was recently doubled. In Trinity County the Trinity, Lewiston, and Madrona dredges were in operation, but in Shasta County the dredge on Clear Creek was dismantled. The Yuba Consolidated Co. operated 4 boats in the Hammonton field, the Capital Dredging Co. 3 boats in the Folsom field, and the Natomas Co. 6 boats in the Natoma field, and the Hammon Engineering Co. was operating 2 boats of the La Grange Gold Dredging Co. in Merced and Stanislaus counties. Exploration work was continued in the Bodie field, Mono County, by the Treadwell Yukon Co., with especial activity centered on the Noonday Vein of the Red Cloud property."

Total Gold Production of California.

The presence of gold in stream gravels near Los Angeles was known and worked in a small way by the Indians, at least as early as 1841,[1] and possibly 1820.[2] On March 2, 1844, Don Manuel Castanares, deputy for California to the Congress of Mexico, reported[3] to his government that placers near Los Angeles had produced up to December, 1843, a total of 2000 ounces of gold dust, most of which had been sent to the United States Mint at Philadelphia.

As the padres and the rancheros discouraged the quest of gold this early, small production caused no particular excitement. It was not until James W. Marshall's finding of gold nuggets in the tail-race of Sutter's saw mill on the American River, January 24, 1848, was heralded abroad that the great rush began, and California became a commonwealth of first rank almost over night. There are, however, no authentic data on gold production prior to 1848, other than occasional, scattered references such as above quoted.

The following table was originally compiled by Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, but for a number of years statistician of the California State Mining Bureau and the U. S. Mint at San Francisco. The authorities chosen for certain periods were: J. D. Whitney, state geologist of California; John Arthur Phillips, author of "Mining and Metallurgy of Gold and Silver" (1867); U. S. Mining Commissioner R. W. Raymond; U. S. Mining Commissioner J. Ross Browne; Wm. P. Blake, Commissioner from California to the Paris Exposition, where he made a report on "Precious

[1] Hittell, T. H., History of California, Vol. II, p. 312, 1885.
[2] Bancroft, H. H., History of California, Vol. II, p. 417, 1886.
[3] Mercantile Trust Review of the Pacific, Vol. XIV, No. 2, p. 43, Feb. 15, 1925.

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Metals'' (1867); John J. Valentine, author for many years of the annual report on precious metals published by Wells, Fargo & Company's Express; and Louis A. Garnett, in the early days manager of the San Francisco refinery, where records of gold receipts and shipments were kept. Mr. Yale obtained other data from the reports of the director of the U. S. Mint and the director of the U. S. Geological Survey. The authorities referred to who were alive at the time of the original compilation of this table in 1894 were all consulted in person or by letter by Mr. Yale with reference to the correctness of their published data, and the final table quoted was then made up.

The figures for 1903–1923 (inclusive) are those prepared by the U. S. Geological Survey; and since by the U. S. Bureau of Mines:

Total Gold Production of California

Year	Value	Year	Value
1848	$245,301	1891	$12,728,869
1849	10,151,360	1892	12,571,900
1850	41,273,106	1893	12,538,780
1851	75,938,232	1894	13,863,282
1852	81,294,700	1895	15,334,317
1853	67,613,487	1896	17,181,562
1854	69,433,931	1897	15,871,401
1855	55,485,395	1898	15,906,478
1856	57,509,411	1899	15,336,031
1857	43,628,172	1900	15,863,355
1858	46,591,140	1901	16,989,044
1859	45,846,599	1902	16,910,320
1860	44,095,163	1903	16,300,653
1861	41,884,995	1904	18,633,676
1862	38,854,668	1905	18,898,545
1863	23,501,736	1906	18,732,452
1864	24,071,423	1907	16,727,928
1865	17,930,858	1908	18,761,559
1866	17,123,867	1909	20,237,870
1867	18,265,452	1910	19,715,440
1868	17,555,867	1911	19,738,908
1869	18,229,044	1912	19,713,478
1870	17,458,133	1913	20,406,958
1871	17,477,885	1914	20,653,496
1872	15,482,194	1915	22,442,296
1873	15,019,210	1916	21,410,741
1874	17,264,836	1917	20,087,504
1875	16,876,009	1918	16,528,953
1876	15,610,723	1919	16,695,955
1877	16,501,268	1920	14,311,043
1878	18,839,141	1921	15,704,822
1879	19,626,654	1922	14,670,346
1880	20,030,761	1923	13,379,013
1881	19,223,155	1924	13,150,175
1882	17,146,416	1925	13,065,330
1883	24,316,873	1926	11,923,481
1884	13,600,000	1927	11 671.018
1885	12,661,044	1928	10,785.315
1886	14,716,506	1929	8,526,703
1887	13,588,614	1930	9,451,162
1888	12,750,000		
1889	11,212,913	Total value	$1,841,656,194
1890	12,309,793		

IRIDIUM (see under Platinum)

IRON ORE

Bibliography: State Mineralogist Reports II, IV, V, X, XII–XV (inc.), XVII, XVIII, XXI–XXVII (inc.). Bulletins 38, 67, 91. Am. Inst. Min. Eng., Trans. LIII. Min. & Sci. Press, Vol. 115, pp. 112, 117–122; Vol. 123, pp. 94–96, 113–114.

A small tonnage of iron was mined in California during the year 1930. The material was magnetite and was obtained by magnetic sepa-

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ration of beach sand and utilized in the manufacture of wear-resisting alloys. As there was only a single operator, the figures are concealed in the 'Unapportioned' total. There was also a tonnage utilized in the manufacture of paint pigments and which is credited to "mineral paint" in this statistical report.

There are considerable deposits of iron ore known in California, notably in Shasta, Madera, Placer, Riverside, San Bernardino and Los Angeles counties, but production has so far been limited for lack of an economic supply of coking coal. Some pig iron has been made, utilizing charcoal for fuel, both in blast furnaces and by electrical reduction; also, ferrochrome, ferromanganese, and ferrosilicon have been made in California.

Total Iron Ore Production of California.

Total iron ore production of California, with annual amounts and values, is as follows:

Year	Tons	Value	Year	Tons	Value
1881*	9,273	$79,452	1915	724	$2,584
1882	2,073	17,766	1916	3,000	6,000
1883	11,191	106,540	1917	2,874	11,496
1884	4,532	40,983	1918	3,108	15,947
1885			1919	2,300	13,796
1886	3,676	19,250	1920	5,975	40,889
1887			1921	1,970	12,030
1893	250	2,000	1922	3,588	18,868
1894	200	1,500	1923	3,102	18,665
1895			1924	785	4,710
1907	400	400	1925		
1908			1926	5,272	26,000
1909	108	174	1927		
1910	579	900	1928		
1911	558	558	1929		
1912	2,508	2,508	1930	[a]	[a]
1913	2,343	4,485			
1914	1,436	5,128	Totals	71,805	$552,629

* Productions for the years 1881-1886 (inc.) were reported as "tons of pig iron" (U. S. G. S., Min. Res. 1885), and for the table herewith are calculated to "tons of ore" on the basis of 47.6% Fe as shown by an average of analyses of the ores (State Mineralogist Report IV, p. 242). This early production of pig iron was from the blast furnaces then in operation at Hotaling in Placer County. Charcoal was used in lieu of coke. Though producing a superior grade of metal, they were obliged finally to close down, as they could not compete with the cheaper English and eastern United States iron brought in by sea to San Francisco.

[a] Annual details concealed under 'Unapportioned.'

LEAD

Bibliography: State Mineralogist Reports IV, VIII–XV (inc.), XVII–XXVII (inc.).

The production of lead in California during 1930 was 3,524,796 pounds of recoverable metal valued at $176,241, as compared with the 1929 figures which were 1,428,777 pounds and $90,014. The average value of lead in 1930 was 5 cents a pound; in 1929 was 6.3 cents per pound and in 1928 was 5.8 cents per pound. As in the past the principal output of lead came from the lead-silver mines of Inyo County.

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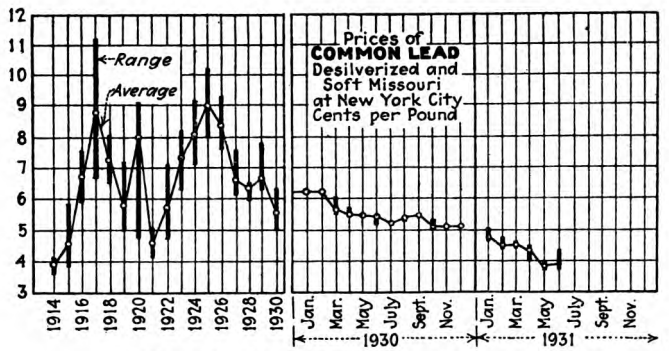
Distribution of the 1930 output by counties was as follows:

County	*Amount*	*Value*
Calaveras	1,297	$65
Inyo	3,452,159	172,608
Madera	4,993	250
Napa	464	23
Nevada	18,164	908
Plumas	491	25
San Bernardino	45,653	2,283
Siskiyou	470	24
Amador, El Dorado, Kern, Los Angeles, Mariposa, Merced, Stanislaus and Tuolumne*	1,105	55
Totals	3,524,796	$176,241

* Combined to conceal output of a single operator in each.



From Engineering and Mining Journal, July 13, 1931.

Lead Production of the United States

According to preliminary data issued by the U. S. Bureau of Mines [1] during 1930, the production of primary lead in the United States was 573,740 short tons, valued at $57,374,000, being a decrease from the national production of 1929 which was 672,498 short tons worth $84,735,000, due to decreased selling price of lead from an average of 6.3 cents a pound in 1929 to 5.0 cents in 1930.

Lead Production of California, by Years.

Statistics on lead production in California were first compiled by this Bureau in 1887. Amount and value of the output, annually, with total figures, to date, are given in the following table:

[1] U. S. Bureau of Mines, Press Bull. May 15, 1931.

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Total Production of Lead in California, by Years

Year	Pounds	Value	Year	Pounds	Value
1877	[a] 7,836,000	$391,800	1905	533,680	$25,083
1878	8,640,000	328,320	1906	338,718	19,307
1879	4,502,000	191,335	1907	328,681	16,690
1880	4,200,000	215,460	1908	1,124,483	46,663
1881	6,680,000	325,316	1909	2,685,477	144,897
1882	[b] 4,000,000	196,800	1910	3,016,902	134,082
1883	[c] 3,400,000	145,520	1911	1,403,839	63,173
1884	3,200,000	120,512	1912	1,370,067	61,653
1885	2,000,000	80,900	1913	3,640,951	160,202
1886	2,000,000	93,400	1914	4,697,400	183,198
1887	[d] 1,160,000	52,200	1915	4,796,299	225,426
1888	900,000	38,250	1916	12,392,031	855,049
1889	940,000	35,720	1917	21,651,352	1,862,016
1890	800,000	36,000	1918	13,464,869	956,006
1891	1,140,000	49,020	1919	4,139,562	219,397
1892	1,360,000	54,400	1920	4,903,738	392,300
1893	666,000	24,975	1921	1,149,051	51,707
1894	950,000	28,500	1922	6,511,280	358,120
1895	1,592,400	49,364	1923	9,934,522	695,416
1896	1,293,500	38,805	1924	4,984,387	398,751
1897	596,000	20,264	1925	7,352,422	639,661
1898	655,000	23,907	1926	8,067,873	645,429
1899	721,000	30,642	1927	2,748,440	173,151
1900	1,040,000	41,600	1928	1,882,795	109,102
1901	720,500	28,820	1929	1,428,777	90,014
1902	349,440	12,230	1930	3,542,796	176,241
1903	110,000	3,960			
1904	124,000	5,270	Totals	189,666,232	$11,366,024

[a] Quantities for 1877–1881 (inc.) from C. E. Siebenthal, Mineral Resources of U. S. 1912, Part I, U. S. Geol. Survey, p. 339; and values for same years from quotations in Eng. & Min. Jour. of New York.
[b] Estimated.
[c] Quantities and values for 1883–1886 (inc.) from Mineral Resources of U. S. Geol. Surv., 1883–1886, respectively.
[d] Data from 1887 to date from reports of California State Mining Bureau.

MANGANESE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVIII, XXII–XXV (inc.). Bulletins 38, 67, 76, 91. U. S. G. S., Bull. 427. Eng. & Min. Jour.-Press, Vol. 117, p. 545.

There were shipments of manganese ore in California during 1930 from Plumas and San Bernardino counties. The annual details are concealed in the 'Unapportioned' item owing to a single shipment in each. These ores showed analyses from 42% to 52% Mn and were utilized as an alloy in steel and for the manufacture of fertilizer.

Importations[1] of foreign manganese ore to the United States in 1930 mainly from Soviet Russia and Brazil amounted to a total of 582,365 long tons valued at $6,476,802, compared with 664,269 long tons worth $8,450,818 in 1929.

The Tariff Act of 1930 provides for an import duty of 1¢ per pound on the metallic manganese contained, for "manganese ore (including ferruginous manganese ore) or concentrates containing in excess of 10 per centum of metallic manganese." The bulk of such ore is consumed in the large steel-producing centers of the eastern United States.

Much valuable research work has been done in recent years, particularly by companies operating in Montana and Virginia, in the beneficiation of manganese ores. The success of their processes appears assured. In reply to the suggestions of certain steel interests to have the manganese import duty removed, the manganese operators organized the American Manganese Producers' Association, which actively worked for retention of the tariff. Such retention will enable the

[1] U. S. Bureau of Foreign and Domestic Commerce, Monthly Summary, Dec., 1930.

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domestic industry to grow and to further develop ore-dressing methods that will make available large tonnages of low-grade material not now marketable.

Manganese Ore Production in California, by Years.

Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Tesla District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5000 tons had been produced by that property. For some years following that, the output was small. The tabulation herewith shows California's ouput of manganese ore, annually, since 1887, when the compilation of such figures was begun by the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1887	1,000	$9,000	1910	265	$4,235
1888	1,500	13,500	1911	2	40
1889	53	901	1912	22	400
1890	386	3,176	1913		
1891	705	3,830	1914	150	1,500
1892	300	3,000	1915	4,013	49,098
1893	270	4,050	1916	13,404	274,601
1894	523	5,512	1917	15,515	396,659
1895	880	8,200	1918	26,075	979,235
1896	518	3,415	1919	11,569	451,422
1897	504	4,080	1920	2,892	62,323
1898	440	2,102	1921	1,005	12,210
1899	295	3,165	1922	540	7,650
1900	131	1,310	1923	690	10,620
1901	425	4,405	1924	1,115	25,785
1902	870	7,140	1925	832	19,450
1903	1	25	1926	235	4,700
1904	60	900	1927		
1905			1928	733	8,216
1906	1	30	1929	*	*
1907	1	25	1930		
1908	321	5,785			
1909	3	75	Totals	88,244	$2,391,770

* Annual details concealed under 'Unapportioned.'

MOLYBDENUM

Bibliography: State Mineralogist Reports XIV, XVII–XXIV (inc.), XXVI. Bulletins 67, 91. U. S. Bur. of Min., Bulletin 111. Proc. Colo. Sci. Soc., Vol. XI.

Molybdenum is used as an alloy constituent in the steel industry, and in certain forms of electrical apparatus. Included in the latter is its successful substitution for platinum and platinum-iridium in electric contact-making and -breaking devices. In alloys it is used similarly to and in conjunction with chromium, cobalt, iron, manganese, nickel, tungsten, and vanadium. The oxides and the ammonium salt have important chemical uses.

The two principal molybdenum minerals are: the sulphide, molybdenite; and wulfenite, lead molybdate; the former furnishing practically the entire commercial output. Molybdenite is found in or associated with acidic igneous rocks, such as granite and pegmatite. The chief commercial sources have been New South Wales, Queensland and Norway, with some also from Canada; but the United States is now able to supply its own requirements.

The growing consumption of molybdenum by alloy-steel makers in the United States has been stimulated by the fact that molybdenum alone of the steel-alloying metals can be produced commercially in the

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United States to an extent which avoids all necessity for importation. Another fact has been the marked adaptability of molybdenum steels to large-scale production of automobile and other parts.

The most important development of 1924-1925 was the elimination of ferromolybdenum from the market due to the substitution of calcium molybdate as the furnace addition by the entire alloy-steel industry. Calcium molybdate is stated to be not only easier and less costly to prepare, but it introduces the molybdenum into the steel bath in a much purer form, the resulting steel being superior to that made with ferromolybdenum.

Deposits of disseminated molybdenite are known in several localities in California, and in at least two places it occurs in small masses associated with copper sulphides. The only recorded commercial shipments of molybdenum ore in California were during the war 1916-1918. Some development work has been recently done on a high-grade deposit at the head of the Kaweah River, Tulare County.

The Tariff Act of 1930 provides for an import duty of 35 cents a pound for the metallic molybdenum content of molybdenum ores or concentrates.

The present quotations on molybdenum ores are 45¢ per pound of MoS_2 contained, delivered at Pittsburgh, Pa., and on ferromolybdenum are $1 per pound Mo, 50%–60% Mo f.o.b. shipping point.

Molybdenum Production of California, by Years.

California's production of molybdenum ore by years is summarized in the following tabulation:

Year	*Tons*	*Value*
1916	8	$9,945
1917	243	9,014
1918	*	300
Totals	251	$19,259

* 300 pounds of 90% MoS_2 concentrate.

NICKEL

Bibliography: State Mineralogist Reports XIV, XVII, XXIV, XXV. U. S. G. S., Bulletin 640-D. U. S. Bureau of Standards, Circular 100.

Nickel occurs in the Friday Copper Mine in the Julian District, San Diego County. The ore is a nickel-bearing pyrrhotite, with some associated chalcopyrite. Some ore has been mined in the course of development work but not treated nor disposed of, as they were unable to get any smelter to handle it for them. Nickel ore has also been reported from other localities in California, but not yet confirmed.

Present quotations for nickel are around 35¢-36¢ per pound for the refined metal.

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OSMIUM (see under Platinum)

PALLADIUM (see under Platinum)

PLATINUM

Bibliography: State Mineralogist Reports IV, VIII, IX, XII–XXVI (inc.). Bulletins 38, 45, 67, 85, 91, 92. U. S. Geol. Surv. Bulletins 193, 285. Trans. Am. Ins. Min. Eng., Vol. 47, pp. 217–218.

In California the platinum group metals are obtained as a by-product from placer operations for gold. The major portion of it comes from the dredges working in Amador, Butte, Sacramento, Stanislaus, Shasta and Yuba counties, with a small amount coming from the hydraulic and surface-sluicing mines of Del Norte, Humboldt, Siskiyou and Trinity counties.

The production of platinum-group metals in California during 1930 totaled 217 fine ounces valued at $11,700, compared with 246 fine ounces worth $14,416 in 1929. The metal came from properties in Amador, Butte, Del Norte, Humboldt, Nevada, Sacramento, Shasta, Siskiyou and Trinity counties. In addition to the above there was some platinum mined and not sold in Stanislaus, Trinity and Yuba counties. Of the above 217 fine ounces, 126 ounces were platinum, 30 ounces of osmium, 42 ounces of iridium and 18 ounces were palladium and ruthenium.

Most of the platinum refiners pay for the osmiridium on the basis of its iridium content. Crude 'platinum' is really a mixture of the metals of that group, and carries varying percentages of platinum, iridium, osmiridium or iridosmine, with occasionally some ruthenium and palladium. In addition to the above-noted production, there is usually some platinum recovered as a by-product in the gold refinery of the mint, but which can not be assigned to the territory of its origin for lack of knowledge as to which lot of gold it belongs. Some platinum and palladium are also recovered in the electrolytic refining of blister copper.

Uses, Markets and Consumption.

Besides its well known uses in jewelry, dentistry and for chemicalware, an important industrial development of recent years employs platinum as a catalyzer in the 'contact process' of manufacturing concentrated sulphuric acid. It is also necessary for certain delicate parts of the ignition systems in automobiles, motor boats and aeroplanes. Experiments have been made to find alloys which can replace platinum for dishes and crucibles in analytical work, but so far with only slight success.

According to the U. S. Bureau of Mines, Department of Commerce,[1] the total consumption of platinum metals in the United States in 1930 was 118,924 fine ounces, a decrease from that consumed in 1929, distributed as follows:

[1] U. S. Bureau of Mines, Dept. of Commerce Press Bulletin, July 9, 1931.

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PLATINUM METALS SOLD BY REFINERS IN THE UNITED STATES 1929 AND 1930, BY CONSUMING INDUSTRIES, IN TROY OUNCES

Industry	*Platinum*	*Palladium*	*Iridium*	*Others*	*Total*	*Per cent of total*
1929						
Chemical	20,260	1,345	113	233	21,951	11
Electrical	20,746	18,856	1,014	89	40,705	21
Dental	13,051	12,156	788	236	26,231	14
Jewelry	84,039	4,451	3,737	851	93,078	49
Miscellaneous	7,234	1,048	347	1,025	9,654	5
Totals	145,330	37,856	5,999	2,434	191,619	100
1930						
Chemical	15,022	854	34	49	15,959	13
Electrical	8,529	9,569	864	70	19,032	16
Dental	11,810	15,436	111	6	27,363	23
Jewelry	44,801	2,807	2,407	526	50,541	43
Miscellaneous	3,324	1,621	208	876	6,029	5
Totals	83,486	30,287	3,624	1,527	118,924	100

STOCKS

At the end of 1930 stocks of platinum metals in the hands of refiners were 88,665 ounces, an increase of 8 per cent as compared with the stocks at the end of 1929.

STOCKS OF PLATINUM METALS IN THE HANDS OF REFINERS IN THE UNITED STATES, DECEMBER 31, 1921–1930, IN TROY OUNCES

Year	*Platinum*	*Palladium*	*Iridium*	*Others*	*Total*
1921	38,514	21,042	4,991	3,113	67,660
1922	41,900	24,975	7,559	1,583	76,017
1923	36,554	26,266	5,208	2,697	70,725
1924	40,464	27,400	3,622	3,053	74,539
1925	44,024	26,740	3,720	4,609	79,093
1926	64,203	31,950	3,933	5,485	105,571
1927	68,757	24,313	4,617	4,369	102,056
1928	45,710	23,018	4,523	5,019	78,270
1929	51,853	20,154	4,716	5,461	82,184
1930	52,853	18,978	8,828	8,006	88,665

Prices.

The prices of all the metals in the platinum group fluctuated more or less during 1930, according to quotations.[1] Pure platinum started 1930 at $63 per fine ounce and remained at this price till January 23, after which frequent reductions were made till September 17, when the price dropped to $34 per fine ounce, then on September 22 it went to $36 per fine ounce where it remained till the end of the year. The quotations on iridium varied between $265 and $150 per fine ounce during 1930. Starting the year 98 to 99 per cent, sponge and powder at $210 to $220. Dropping in May to as low as $150 per fine ounce, raising to $265 a fine ounce in June and ending the year at $180 to $200 per fine ounce. Osmium varied between $60 and $75 per fine ounce during the year; palladium between $36 and $19 a fine ounce; ruthenium between $35 and $48 per fine ounce; rhodium between $45 and $55 per fine ounce.

[1] Engineering and Mining Journal, Vols. 129 and 130, 1930.

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Platinum Production of California, by Years.

The annual production and values since 1887 have been as follows:

Year	Ounces	Value	Year	Ounces	Value
1887	100	$400	1909	416	$10,400
1888	500	2,000	1910	337	8,386
1889	500	2,000	1911	511	14,873
1890	600	2,500	1912	603	19,731
1891	100	500	1913	368	17,738
1892	80	440	1914	463	14,816
1893	75	517	1915	667	21,149
1894	100	600	1916	886	42,642
1895	150	900	1917	610	43,719
1896	162	944	1918	571	42,788
1897	150	900	1919	*418	60 611
1898	300	1,800	1920	477	68,977
1899	300	1,800	1921	613	58,754
1900	400	2,500	1922	795	90,288
1901	250	3,200	1923	602	78,546
1902	39	468	1924	273	36,452
1903	70	1,052	1925	292	39,937
1904	123	1,849	1926	322	32,005
1905	200	3,320	1927	139	10,749
1906	91	1,647	1928	312	27,902
1907	300	6,255	1929	212	14,416
1908	706	13,414	1930	217	11,700
			Totals	15,394	$815.585

* Fine ounces, beginning with 1919.

QUICKSILVER

Bibliography: State Mineralogist Reports IV, V, XII-XV, XVII-XXVI (inc.). Bulletins 27, 78, 91. U. S. Geol. Surv., Monograph XIII. U. S. Bur. of Mines, Tech. Papers 96, 227; Bulletin 222, 335.

The production of quicksilver in California during 1930 was 11,374 flasks (76 pounds) valued at $1,255,257. This was an increase in both quantity and value over the 1929 output which was 10,152 flasks worth $1,195,705. Distribution of the 1930 output of quicksilver by counties was as follows:

County	*Flasks*	*Value*
Fresno	147	$2,240
Lake	1,760	195,710
Napa	2,000	213,840
San Luis Obispo	1,306	157,440
Colusa, Contra Costa, Kern, Monterey, San Benito, Santa Barbara, Santa Clara, Siskiyou, Solano, Sonoma and Trinity*	6,161	674,849
Totals	11,374	$1,255,257

* Combined to conceal the output of single operators in each.

Prices.

During 1930 the average monthly New York quotations [1] were $115 for a 76-pound flask. The price at the beginning of the year was $122 per flask and during the year the quotations fluctuated, but with a general trend downward, ending the year at $104 per flask. The average quotation for 1929 was $122 per flask. The average amount received by producers in California during 1930, according to reports received by the Division of Mines, was $110.36 for 76-pound flask, compared with $117.78 a flask in 1929 and $118.84 a flask in 1928.

[1] Engineering and Mining Journal for 1930, Vols. 129 and 130.

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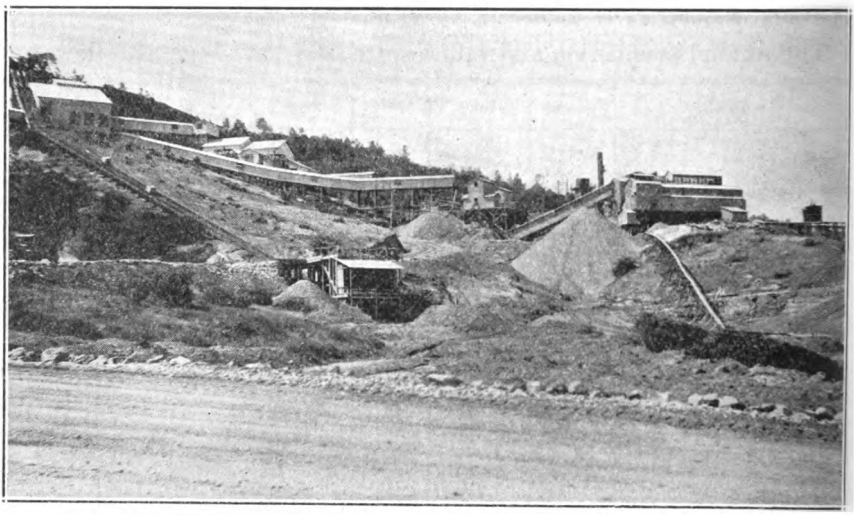

Mill and Furnace Plant Sulphur Bank Mine on Clear Lake, Lake County.
—*Photo by C. N. Schuette*

Open-cut and Glory-hole at upper level of New Idria Quicksilver Mine, San Benito County.
—*Photo by Walter W. Bradley*

The United States Bureau of Mines[1] reported the total production of the United States for 1930 at 21,553 flasks, valued at $2,478,789.

[1] U. S. Bureau of Mines, Dept. of Comm., Press Bull., June 19, 1931.

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California was by a wide margin the largest producing state with approximately 53% of the total. The other producing states in order of their output were Nevada, Oregon, Texas, Arizona, Alaska and Washington. The national production for 1929 was 23,682 flasks worth $2,892,638.

In 1930 imports of quicksilver were 2,943 flasks, valued at $295,829, of which 2,802 flasks came from Spain and the remaining 141 flasks from Mexico. The 1930 imports were a decrease from the 1929 when the United States received 14,292 flasks worth $1,447,142 from Spain, Belgium, Mexico, Italy, Germany, Canada, France and Peru.

Uses.

The most important uses of quicksilver are the recovery of gold and silver by amalgamation, and in the manufacture of fulminate for explosive caps, of drugs, of electrical appliances, of scientific apparatus, pigments and cosmetics. By far the greatest consumption is in the manufacture of fulminate and drugs. Radio tubes, Neon and mercury lights and electrical appliances are taking increasing amounts.

Total Quicksilver Production of California.

Total amount and value of the quicksilver production of California, as given in available records, are shown in the following tabulation.

Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850	7,723	$768,052	$99 45	1892	27,993	$1,139,595	$40 71
1851	27,779	1,859,248	66 93	1893	30,164	1,108,527	36 75
1852	20,000	1,166,600	58 33	1894	30,416	934,000	30 70
1853	22,284	1,235,648	55 45	1895	36,104	1,337,131	37 04
1854	30,004	1,663,722	55 45	1896	30,765	1,075,449	34 96
1855	33,000	1,767,150	53 55	1897	26,691	993,445	37 28
1856	30,000	1,549,500	51 65	1898	31,092	1,188,626	38 23
1857	28,204	1,374,381	48 73	1899	29,454	1,405,045	47 70
1858	31,000	1,482,730	47 83	1900	26,317	1,182,786	44 94
1859	13,000	820,690	63 13	1901	26,720	1,285,014	48 46
1860	10,000	535,500	53 55	1902	29,552	1,276,524	43 20
1861	35,000	1,471,750	42 05	1903	32,094	1,335,954	42 25
1862	42,000	1,526,700	36 35	1904	[a] 28,876	1,086,323	37 62
1863	40,531	1,705,544	42 08	1905	24,655	886,081	35 94
1864	47,489	2,179,745	45 90	1906	19,516	712,334	36 50
1865	53,000	2,432,700	45 90	1907	17,379	663,178	38 16
1866	46,550	2,473,202	53 13	1908	18,039	763,520	42 33
1867	47,000	2,157,300	45 90	1909	16,217	773,788	47 71
1868	47,728	2,190,715	45 90	1910	17,665	799,002	45 23
1869	33,811	1,551,925	45 90	1911	19,109	879,205	46 01
1870	30,077	1,725,818	57 38	1912	20,600	866,024	42 04
1871	31,686	1,999,387	63 10	1913	15,661	630,042	40 23
1872	31,621	2,084,773	65 93	1914	11,373	557,846	49 05
1873	27,642	2,220,482	80 33	1915	14,199	1,157,449	81 52
1874	27,756	2,919,376	105 18	1916	21,427	2,003,425	93 50
1875	50,250	4,228,538	84 15	1917	24,382	2,396,466	98 29
1876	75,074	3,303,256	44 00	1918	22,621	2,579,472	114 03
1877	79,396	2,961,471	37 30	1919	15,200	1,353,381	89 04
1878	63,880	2,101,652	32 90	1920	10,278	775,527	75 45
1879	73,684	2,194,674	29 85	1921	3,157	140,666	44 56
1880	59,926	1,857,706	31 00	1922	3,466	191,851	55 35
1881	60,851	1,815,185	29 83	1923	5,458	332,851	60 98
1882	52,732	1,488,624	28 23	1924	7,948	543,080	68 33
1883	46,725	1,343,344	28 75	1925	7,683	621,831	80 81
1884	31,913	973,347	30 50	1926	5,892	516,382	87 64
1885	32,073	986,245	30 75	1927	6,488	714,418	111 67
1886	29,981	1,064,326	35 50	1928	[b] 7,107	844,649	118 84
1887	33,760	1,430,749	42 38	1929	10,152	1,195,705	117 78
1888	33,250	1,413,125	42 50	1930	11,374	1,255,257	110 36
1889	26,464	1,190,880	45 00				
1890	22,926	1,203,615	52 50	Totals	2,254,552	$113,057,530	
1891	22,904	1,036,406	45 25				

[a] Flasks of 75 lbs. since June, 1904; of 76½ lbs. previously.
[b] Flasks of 76 pounds, from January, 1928.

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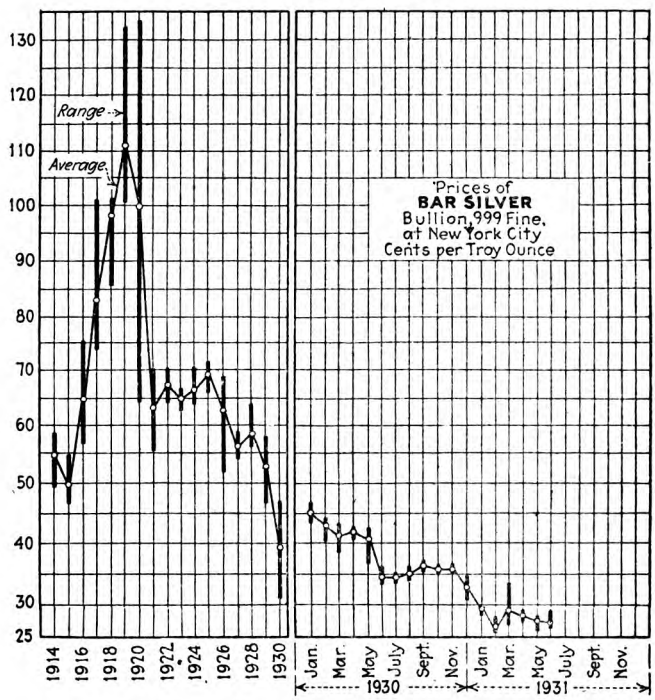
Though the New Almaden Mine in Santa Clara County was first worked in 1824, and has been in practically continuous operation since 1846 (the yield being small the first two years), there are no available data on the output earlier than 1850. Previous to June, 1904, a 'flask' of quicksilver contained 76½ pounds; then 75 pounds up to and including 1927; beginning with 1928, of 76 pounds. In compiling this table the following sources of information were used: for 1850–1883, table by J. B. Randol, in Report of State Mineralogist, IV, p. 336; 1883–1893, U. S. Geological Survey reports; 1894 to date, statistical bulletins of the State Mining Bureau; also State Mining Bureau, Bulletin 27, "Quicksilver Resources of California," 1908, p. 10.

SILVER

Bibliography: State Mineralogist Reports IV, VIII, XII-XXVI (inc.). Bulletins 67, 91. Min. & Sci. Press, March 1, 1919.

The 1930 silver production in California totaled 1,622,803 fine ounces, valued at $624,779, as compared with the 1929 output of 1,176,895 fine ounces, worth $627,285, being an increase in amount with a decrease in total value. Of the 1930 yield, 12,626 fine ounces worth $4,861 came from placers. The average price of domestic silver was 38.5 cents per fine ounce in New York for 1930, compared with 53.3 cents per fine ounce in 1929 and 58.5 cents per fine ounce for 1928.



From Engineering and Mining Journal, July 13, 1931.

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Distribution of the 1930 silver production by counties was as follows:

County	*Fine ounces*	*Value*
Alameda	41	$16
Amador	18,441	7,100
Butte	1,097	422
Calaveras	4,038	1,555
Contra Costa	199,186	76,687
Del Norte	2	1
El Dorado	650	250
Fresno	55	21
Humboldt	24	9
Inyo	111,587	42,961
Kern	4,564	1,757
Lassen	59	23
Madera	183	70
Mariposa	826	318
Merced	378	146
Mono	8,224	3,166
Napa	266,386	102,559
Nevada	60,561	23,316
Placer	189	73
Plumas	426,038	164,025
Riverside	100	38
Sacramento	3,411	1,313
San Bernardino	463,625	178,496
San Diego	27	10
San Luis Obispo	3	1
Shasta	14,135	5,442
Sierra	5,340	2,056
Siskiyou	10,836	4,172
Stanislaus	541	208
Trinity	17,403	6,700
Tulare	808	311
Tuolumne	780	300
Ventura	5	2
Yuba	3,260	1,255
Totals	1,622,803	$624,779

The following paragraphs are quoted from the United States Bureau of Mines, Department of Commerce, Advanced Chapter or Gold and Silver for 1930 by courtesy of Mr. V. C. Heikes, statistician in charge of the San Francisco Branch office:

"The mine production of silver in California was 1,622,803 ounces, valued at $624,779, an increase of 445,908 ounces in quantity and a decrease of $2,506 in value compared with 1929. No company or any one property produced more than 500,000 ounces and only 4 more than 100,000 ounces, 1 between 50,000 and 100,000 ounces, and 26 each with less than 50,000 ounces. The chief silver-producing counties in 1930 were San Bernardino, Plumas, Napa and Inyo, ranging from a high of 463,625 ounces to a low of 111,587 ounces, followed by Nevada County with an output between 50,000 and 100,000 and by Amador, Trinity, Shasta, and Siskiyou each with an output between 10,000 and 20,000 ounces. Of the total silver output from lode mines dry silver ore yielded nearly 45 per cent, copper ore, 29 per cent; copper-lead ore 12 per cent; the remainder came equally from gold ore and tailings and lead ore. The largest producers of silver were the Wortley Consolidated Mines (Inc.), Walker Mining Co., Banner Development Co., American Smelting & Refining Co., Engels Copper Mining Co., American Foundation Co., Empire Star Mines Co., (Ltd.), New Sutherland Divide Mining Co., Zenda Gold Mining Co., and the Island Copper Co. The yield of silver from placer mines was 12,626 ounces, valued at $4,861.

"The mining of silver-lead ores in Inyo County and of silver ore in Napa County were the chief sources of the increased yield of silver, though some gain was also made from the mining of copper ore, particularly in Plumas County. The Banner Development Co. operating the Palisades mine in Napa County, augmented its silver yield with an increased gold output; the ores of this property are showing a higher gold content as the vein is developed. The Kelly Rand or Uranium and the Santa Fe silver properties in San Bernardino County were operated jointly by the Wortley Consolidated Mines Co. and silver ore was both milled and shipped. In the Calico district the Zenda Gold Mining Co. did considerable underground work and shipped silver ore to a smelter. On account of the low price of silver the Comache Mining and Milling Co. discontinued shipments of silver ore from its Mono County property, which was closed in January."

Silver Production of California, by Years.

The amount and value of the silver production of California, and the average price, annually, since 1880 are given in the table following.

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In the table shown in the statistical bulletins previous to Bulletin 97 (for 1925), the values shown for 1880–1904 (inc.) were taken from the reports of the Director of the Mint, of which the figures for 1880-1896 (inc.) were based on 'coinage value' ($1.2929 per fine ounce). We have recalculated these to commercial value, using the price table of the U. S. Geological Survey (McCaskey, H. D., Gold and Silver, 1913: Mineral Resources of the U. S., Part I, p. 847). From 1905 to date, the figures are those of the U. S. Geological Survey and its successor, the U. S. Bureau of Mines:

Silver Production of California, by Years, Since 1880

Year	Fine oz.	Value	Average price per oz.	Year	Fine oz.	Value	Average price per oz.
1880	882,169	$1,014,494	$1 15	1907	1,138,856	$751,646	$0 66
1881	580,091	655,503	1 13	1908	1,647,278	873,057	53
1882	653,569	745,069	1 14	1909	2,008,253	1,091,092	52
1883	1,129,244	1,253,461	1 11	1910	1,840,085	993,646	54
1884	3,236,987	3,593,056	1 11	1911	1,270,445	673,336	53
1885	1,986,260	2,125,298	1 07	1912	1,300,136	799,584	615
1886	1,245,747	1,233,290	0 99	1913	1,378,399	832,553	604
1887	1,262,282	1,237,036	0 98	1914	1,471,859	813,938	553
1888	1,314,874	1,235,982	0 94	1915	1,678,756	851,129	507
1889	823,947	774,510	0 94	1916	2,564,354	1,687,345	658
1890	820,336	861,353	1 05	1917	1,775,431	1,462,955	824
1891	737,224	729,852	0 99	1918	1,427,711	1,427,711	1 00
1892	358,575	311,960	87	1919	1,107,189	1,240,051	1 12
1893	415,468	324,065	78	1920	1,706,327	1,859,896	1 09
1894	229,896	144,834	63	1921	3,629,223	3,629,223	1 00
1895	463,911	501,542	65	1922	3,100,065	3,100,065	1 00
1896	326,757	222,195	68	1923	3,559,443	2,918,743	82
1897	754,648	452,789	60	1924	3,555,133	2,381,952	67
1898	701,788	414,055	59	1925	3,054,416	2,119,765	694
1899	855,869	513,521	60	1926	2,022,460	1,262,015	624
1900	1,168,157	724,257	62	1927	1,620,242	918,677	567
1901	950,831	570,499	60	1928	1,478,771	865,081	585
1902	1,163,041	616,412	53	1929	1,176,895	627,285	533
1903	958,230	517,444	54	1930	1,622,803	624,779	385
1904	1,441,259	835,929	58				
1905	1,076,174	650,009	61	Totals	73,982,505	$56,681,769	
1906	1,220,641	817,830	68				

TIN

Bibliography: Reports XV, XVII, XVIII, XXV. Bulletins 67, 91.

In 1928 and 1929 there was a small amount of tin produced from Californian ore as well as considerable development work which was done at the Temescal mine in Riverside County near Corona.

There was an output from the district during 1891–1892 as tabulated below. Small quantities of stream tin have been found in some of the placer workings in northern California, but never in paying amounts.

Two occurrences have also been noted, in northern San Diego County. Crystals of cassiterite were found there, associated with blue tourmaline crystals, amblygonite and beryl. No commercial quantity has been developed, only small pockets have been taken out.

On March 12, 1929, the new tin plating plant of the Columbia Steel Corporation at Pittsburg, Contra Costa County, California, started operation. This is the first tin plate mill west of St. Louis. This mill will have an annual capacity of 38,000 tons of tin plate per year and will give the Pacific Coast a local source for their tin plate.

The principal sources of the world's supply of tin are the islands of Banka, Billiton and Singkep, Netherlands India (Dutch East Indies),

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followed by the Federated Malay States (Perak, Pahang, Negri Sembilan and Selangor). Bolivia, Siam, Cornwall, Transvaal, New South Wales, Queensland and Tasmania are also important sources. A measurable amount of the metal is also recovered by detinning scrap and old cans.

Total Output of Tin in California

Year	*Pounds*	*Value*
1891	125,289	$27,564
1892	126,000	32,400
1928}	*	*
1929}		
Totals	251,289	$59,964

* Annual details concealed under 'Unapportioned.'

TITANIUM

Bibliography: State Mineralogist's Report XXIII.

During 1930 there was no production of titanium ores reported in California. In 1927 the first recorded shipments of titanium minerals were made in California. The total of the 1927 and 1928 production was 10,013 tons valued at $150,195. All of this came from Los Angeles County and was produced from either the black beach sands, which probably contained approximately 20% titaniferous iron and magnetite, the gangue being silica and several silicates, or from a lode deposit in the San Gabriel Mountains.

Titanium is widely distributed in a variety of minerals, but its commercial sources are limited to three forms, rutile (oxide), ilmenite (titanite), and titaniferous magnetite (iron ore rich in titanium). There are several known areas where large deposits of these minerals are found in America, mostly titaniferous iron. Of the titaniferous iron deposits only a portion of the Adirondack deposit, some small deposits in North and South Carolina, and those in Los Angeles County are capable of being separated into a high-grade ilmenite and a low titanium magnetite.

The metal is used in several different alloys with iron, copper and aluminum and for green and white paint pigments, the only colors of titanium pigments now in common use. It is also used in dyes, rubber, as a porcelain glaze, in glass, and cement made from high-titanium iron slags. This cement is resistant to the action of acids.

The market price of titanium minerals varies as to the titanium oxide it contains. Rutile 94% TiO at 10¢ a pound, ilmenite 45 to 52% TiO at $10 to $12 a ton, and ilmenite 32 to 35% TiO at $7 to $8 a ton, all prices Atlantic seaboard.

TUNGSTEN

Bibliography: Reports XV, XVII, XVIII, XXII, XXIV, XXVI (inc.). Bulletins 38, 67, 91, 95. U. S. G. S. Bull. 652. Proc. Colo. Sci. Soc., Vol. XI, South Dakota School of Mines. Bulletin No. 12. Eng. and Min. Jour.-Press, Vol. 113, pp. 666–669, Apr. 22, 1922.

The commercial production of tungsten ores and concentrates in California began in 1905; and has been continuous since, with the exception of 1920–1922 (inclusive), when the mines were shut down owing to low prices due to excess stocks following the war and to lack

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of tariff protection against foreign importations. Production was resumed on a small scale late in 1923, and regained practically its pre-war average annual tonnage, though the 1930 figures are less than those for 1929. The material shipped in 1930 included both high-grade sorted ore and concentrates, coming from a property each in Inyo and San Bernardino counties. The annual details are concealed under the 'Unapportioned' item to conceal the output of either shipper. Besides the above there was some tungsten ore mined but not shipped in both Kern and Tulare counties.

Quotations[1] during 1930 ranged from $15.50 to $12.50 per unit of WO_3 for Chinese wolframite; domestic scheelite ranged from $16.50 to $13 per unit WO_3. The present prices are per unit WO_3, New York, $11.25 to $11.50 for wolframite and $12 for domestic scheelite.

Imports of foreign tungsten ores and alloys into the United States during 1930 amounted to 3,613,109 pounds, valued at $1,658,890 compared with 6,809,965 pounds, valued at $2,510,270 in 1929, and 10,362 long tons of ore valued at $11,409,237 in 1918, which ores were duty free up to September 22, 1922. Owing to lack of protection against the cheap coolie labor of Asiatic tungsten mines and low market prices, practically all of the tungsten mines in the United States were closed down from the middle of 1919 to the latter part of 1923. Quotations during 1922 ranged around $2.50 per unit, up to September of that year when the tariff was placed on the ore. The Tariff Act of 1930 raised the duty on tungsten ore or concentrates to 50 cents per pound on the metallic tungsten contained therein. Duties are also provided for imported tungsten-bearing alloys. Most of the imported ore is coming from China, with smaller amounts from Malay and Bolivia.

Tungsten ore has been produced in California principally in the Atolia-Randsburg district in San Bernardino and Kern counties, followed by the Bishop district in Inyo County, with small amounts coming from Nevada County and from the district near Goffs, in eastern San Bernardino. Most of the California tungsten ore is scheelite (calcium tungstate), though wolframite (iron-manganese tungstate) and hübernite (manganese tungstate) also occur. The deposits at Atolia are the largest and most productive scheelite deposits known,[2] and the output has in some years equaled or exceeded that of ferberite (iron tungstate) from Boulder County, Colorado. It is interesting in this connection to note that, in practically all other tungsten producing districts of the world, wolframite is the important constituent.

Uses.

The metal, tungsten, is used mainly in the steel industry and in the manufacture of electrical appliances, including the well-known tungsten filament lamps. Because of its resistance to corrosion by acids, it is valuable in making certain forms of chemical apparatus. Its employment in tool-steel alloys permits the operation of cutting tools, such as in lathe work, at a speed and temperature at which carbon steel would lose its temper—hence the name 'high speed' steels for these tungsten alloys. As made in the United States, tungsten forms 13% to 20% of

[1] Engineering and Mining Journal, Vol. 129 and 130, 1930.
[2] U. S. G. S. Bull. 652, p. 32.

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such steels. Some chromium, nickel, cobalt, or vanadium are sometimes also included. Tungsten compounds are used in the manufacture of colors. The indicated consumption is approximately 5000 tons of 60% concentrates per year, in the United States.

Tungsten is introduced into the molten steel charge, either as the powdered metal or as ferro-tungsten (containing 50%–85% tungsten). The specific gravity of the pure metal, 19.3–21.4, is exceeded only by platinum, 21.5; iridium, 22.4; and osmium, 22.5. Its melting point is 3267° C. (5913° F.), being higher than any other known metal. Though millons of tungsten filament lamps are now made, the wires are so fine that the metal they contain represents but a few tons of tungsten concentrates annually.

Total Tungsten Ore Production of California.

The annual amount and value of tungsten ores and concentrates produced in California since the inception of the industry is given herewith, with tonnages recalculated to 60% WO_3:

Year	Tons at 60% WO_3	Value	Year	Tons at 60% WO_3	Value
1905	57	$18,800	1918	1,982	$2,832,222
1906	485	189,100	1919	214	219,316
1907	287	120,587	1920		
1908	105	37,750	1923	34	19,126
1909	577	190,500	1924	781	446,009
1910	457	208,245	1925	573	348,475
1911	387	127,706	1926	441	316,560
1912	572	206,000	1927	398	429,237
1913	559	234,673	1928		
1914	420	180,575	1929	150	106,280
1915	962	1,005,467	1930	*	*
1916	2,270	4,571,521			
1917	2,466	3,079,013	Totals	14,177	$14,887,158

* Annual details concealed under 'Unapportioned.'

VANADIUM

Bibliography: Report XV, XXVI. Bulletins 67, 91. Proc. Colo. Sci. Soc., Vol. XI. U. S. Bur. of Mines, Bulletin 104.

No commercial production of vanadium has yet been made in California. Occurrences of this metal have been found at Camp Signal, near Goffs, in San Bernardino County, and two companies at one time did considerable development work in the endeavor to open up paying quantities. Each had a mill under construction in 1916, but apparently no commercial output was made. Ore carrying the mineral cuprodescloizite and reported as assaying 4% V_2O_5 was opened up. Some ore carrying lead vanadate has been developed in the 29 Palms, or Washington district, on the line between Riverside and San Bernardino counties, but no shipments reported.

The principal use of vanadium is as an alloy in steels, especially in tool steel, and in those varieties where resistance to repeated strains is required. Present New York quotations for ferrovanadium are $3.16–$3.50 per pound of vanadium f. o. b. works, and vanadium ore 28¢ per pound V_2O_5 contained.

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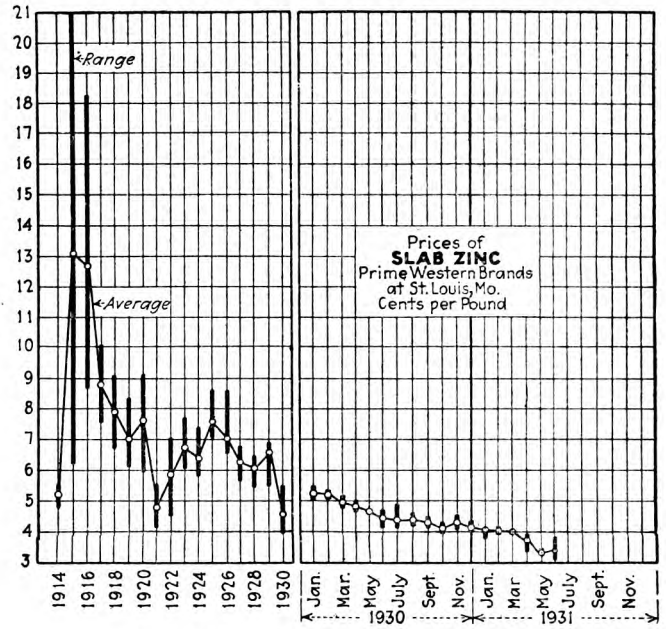
ZINC

Bibliography: State Mineralogist Reports XIV, XV, XVII, XVIII, XX–XXIV, XXVI. Bulletins 38, 67, 91.

There was no recorded production of zinc ores in California during 1930. Owing to the low price of zinc and the distance required to ship the concentrates to a smelter, it is not profitable to smelt the ore at present. During the last period of production most of California's zinc concentrates were shipped to Belgium for smelting, although a small amount has been made into zinc oxide here in the state. The American zinc smelters are located along the Mississippi River or on eastern seaboard, with electrolytic zinc plants in both Idaho and Montana.



From Engineering and Mining Journal, July 13, 1931.

The zinc ores of Shasta and Calaveras counties are associated with copper, while those of Inyo, Los Angeles and San Bernardino are associated principally with lead-silver and zinc-silver ores.

The principal uses of zinc are for 'galvanizing' (plating on iron to prevent rust), for zinc oxide (used in rubber goods and paint), and for brass (an alloy of copper and zinc). These outlets for the metal take approximately 80% of the quantity produced. Of the remaining 20% a large portion is rolled into plates and sheets and utilized in the building industry for sheathing, roofing, leaders, and eaves-troughs. Zinc is particularly desirable and efficient for roofing and siding where corrosive gases are present, as at smelters, refineries and chemical plants.

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Zinc Production of the United States.

The production of slab zinc [1] at reduction plants in the United States in 1930 amounted to 532,894 short tons at $51,158,000, not including 8684 tons of primary metal made from foreign ores, all from Mexico, and reduced in refineries in this country, and 34,849 tons of redistilled secondary metal. The 1930 production was a decrease from that of 1929 which was 532,894 tons for United States only.

The average price per pound quoted for the metal in 1930 was 4.6¢ as compared with 6.5¢ in 1929 and 6.03¢ in 1928.

Total Zinc Production of California.

Total figures for zinc output of the state are as follows, commercial production dating back only to 1906:

Year	Pounds	Value	Year	Pounds	Value
1906	206,000	$12,566	1919	1,384,192	$101,046
1907	177,759	10,598	1920	1,188,009	96,229
1908	54,000	3,544	1921	846,184	42,309
1909			1922	3,034,430	172,963
1910			1923		
1911	2,679,842	152,751	1924	3,060,000	198,900
1912	4,331,391	298,866	1925	11,546,602	877,542
1913	1,157,947	64,845	1926	20,447,559	1,533,568
1914	399,641	20,381	1927	8,625,004	552,000
1915	13,043,411	1,617,383	1928		
1916	15,950,565	2,137,375	1929		
1917	11,854,804	1,209,190			
1918	5,565,516	506,466	Totals	105,552,901	$9,608,522

[1] U. S. Bureau of Mines, Department of Commerce. Press Bulletin, April 23, 1931.

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CHAPTER FOUR

STRUCTURAL MATERIALS

Bibliography: State Mineralogist Reports XII–XXVII (inc.). Bulletin 38. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. See also under each substance.

As indicated by this subdivision heading, the mineral substances herein considered are those more or less directly used in building and structural work. California is independent, so far as these are concerned, and almost any reasonable construction can be made with materials produced in the state.

This branch of the mineral industry for 1930 was valued at $37,126,700, as compared with a total value of $46,759,148 for the year 1929, the decrease being mainly due to cement and in a smaller way to brick and hollow building tile, miscellaneous stone and all other materials in this group with the exception of bituminous rock, lime and sandstone. The three last-mentioned showed increases in both amount and total value.

The 1927 output established a record for this type of material in both quantity and total value which was $54,861,649, exceeding all other years in total value records.

Crushed rock production is yearly more worthy of consideration, due to the strides taken in the use of concrete, as well as to activity in the building of good roads. Brick, with an average annual output for a number of years worth approximately $2,000,000, had difficulty in holding its own, due to the popularity of cement and concrete. In 1920, however, the sales increased to nearly double the previous record figure of the year 1907, and in 1923 showed advances to new figures, with a slight recession in 1924–1930. This item will, no doubt, continue to be an important one, and a market for fire and fancy brick of all kinds will unquestionably never be lacking.

In 1930 all counties, with the exception of Sutter, contributed to this structural total. There is not a county in the fifty-eight counties of the state which is not capable of producing at least one of the materials under the classification and in 1926 every county contributed one or more substances to the group.

During 1930 building construction in California continued on a downward trend as shown in a survey[1] made covering 51 California cities. In these cities building permits showed an average decline of approximately 24.6 per cent from the previous year. Seven cities showed increases in their building permits and 44 showed decreases. Highway construction and contracts for heavy construction were approximately the same as those of 1929.

The bearing of building conditions on the production of structural materials is shown by the following curves: Chart 1 follows the trend

[1] California State Chamber of Commerce, Economic Survey Report No. 24 and 25, Series 1929 and 1930.

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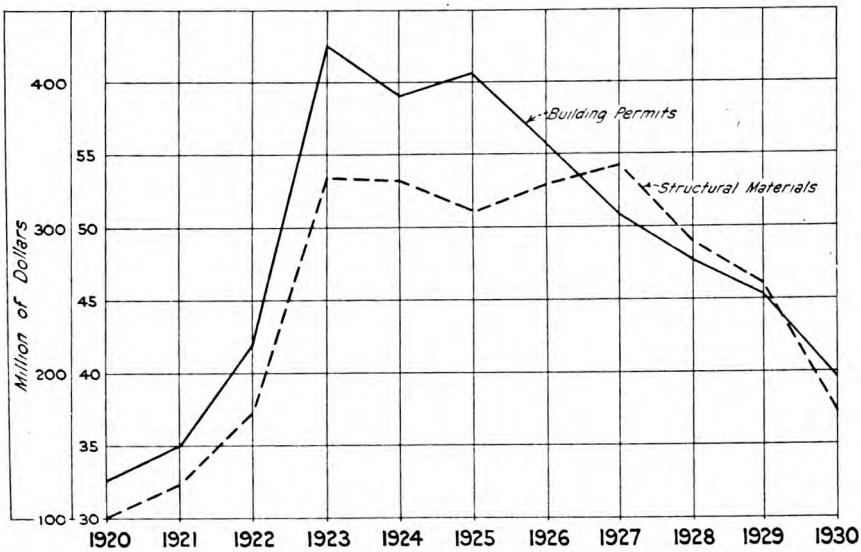

Chart 1, showing the comparative values of building permits in 51 California cities and the production of structural materials in California, from 1920 to 1930.

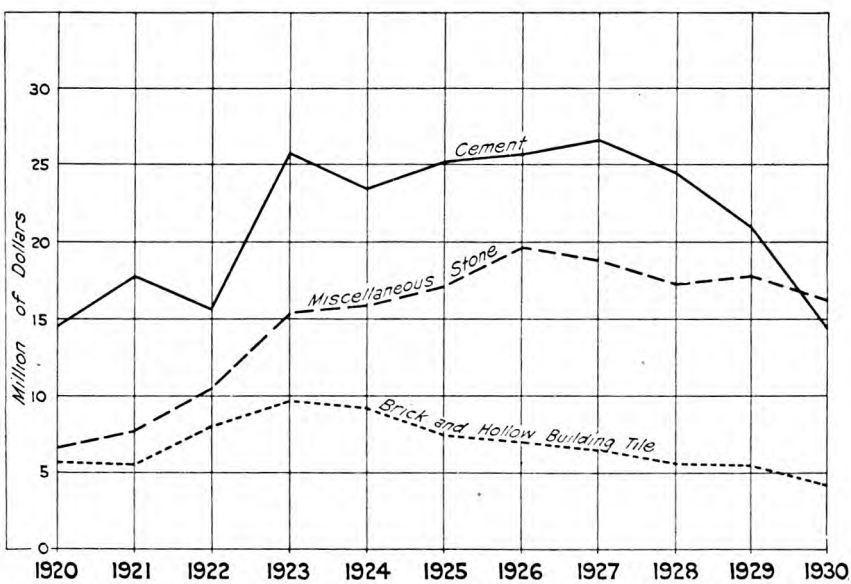

Chart 2, showing the comparative value of the production in California of the most important structural materials from 1920 to 1930, inclusive: Cement, Miscellaneous Stone, Brick and Hollow Building Tile.

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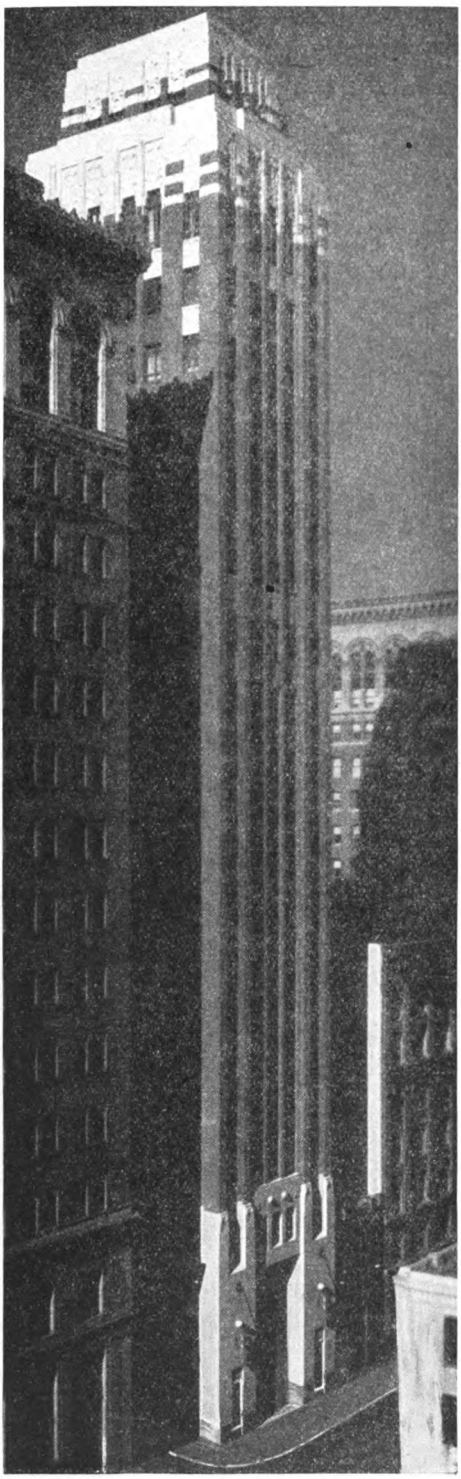

PACIFIC NATIONAL BANK BUILDING

Brick—Cannon & Co.

Granite—McGilvray-Raymond Corporation.

Stucco—California Stucco Products Co. of Northern California.

Travertine Stone—P. Grassi & Co.

—Cut by courtesy of Architecture and Allied Arts.

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of the value of construction represented by building permits in 51 California cities for a ten-year period from 1920 to 1930, inclusive, accompanied by the total production of structural materials. Chart 2 shows the trend in value of cement, miscellaneous stone, brick and hollow building tile, the three most important structural materials, over the same period of time.

The following summary shows the value of the structural materials produced in California during the years 1929–1930, with increases or decreases in each instance:

Substance	1929		1930		Increase— Decrease+ Value
	Amount	Value	Amount	Value	
Bituminous rock	3,320 tons	$14,360	8,525 tons	$36,075	21,715+
Brick and hollow building tile		5,607,410		4,205,460	1,401,950—
Cement	12,794,729 bbls.	21,038,565	9,831,938 bbls.	14,575,731	6,462,834—
Chromite	327 tons	5,025	80 tons	1,905	3,120—
Granite		1,169,271		855,477	313,794—
Lime	42,834 tons	417,101	47,622 tons	452,084	34,983+
Magnesite	47,269 tons	488,014	38,681 tons	388,472	99,542—
Marble[a]		93,661		82,194	11,467—
Sandstone		49,881		56,404	6,523+
Stone, miscellaneous		17,840,159		16,403,027	1,437,132—
Unapportioned		[b]35,701		[c]41,871	6,170+
Total value		$46,759,748		$37,098,700	
Net decrease					$9,660,448

[a] Includes onyx and travertine.
[b] Includes slate and tube-mill pebbles.
[c] Includes slate-paving blocks and tube-mill pebbles.

ASPHALT

Bibliography: State Mineralogist Reports VII, X, XII–XV (inc.), XVII, XVIII. Bulletins 16, 32, 63, 67, 69, 91.

Asphalt was for a number of years accounted for in the statistical reports by the State Mining Bureau, because in the early days of the oil industry, considerable asphalt was produced from outcroppings of oil sand, and was a separate industry from the production of oil itself. However, at the present time most of the asphalt comes from the oil refineries, which produce a better and more uniform grade; hence, its value is not now included in the mineral total, as to do so would be in part a duplication of the crude petroleum figures. Such natural asphalt as is at present mined is in the form of bituminous sandstones, and is recorded under that designation.

BITUMINOUS ROCK

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XXI, XXII, XXV, XXVI.

This material is essentially an uncemented sandstone which is saturated with and held together by a natural asphaltic constituent, probably the residue from the evaporation of a crude petroleum deposit. Bituminous rock is still used to a limited extent for road dressing in those districts adjacent to available deposits, though the manufacture of asphalt at the oil refineries has almost entirely superseded the direct use of the native material. Some of the Santa Cruz County produc-

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tion is put on the market as a material which can be laid cold. This material is especially applicable and valuable for patch jobs.

Shipments of bituminous rock were made from quarries in Santa Barbara and Santa Cruz, totaling 8525 tons valued at $36,075 f.o.b. railroad. This was an increase in both quantity and value over the 1929 output, which was $3320 tons and $14,360.

Bituminous Rock Production of California, by Years.

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

Year	Tons	Value	Year	Tons	Value
1887	36,000	$160,000	1910	87,547	$165,711
1888	50,000	257,000	1911	75,125	117,279
1889	40,000	170,000	1912	44,073	87,467
1890	40,000	170,000	1913	37,541	78,479
1891	39,962	154,164	1914	66,119	166,618
1892	24,000	72,000	1915	17,789	61,468
1893	32,000	192,036	1916	19,449	66,561
1894	31,214	115,193	1917	5,590	18,580
1895	38,921	121,586	1918	2,561	9,067
1896	49,456	122,500	1919	4,614	18,537
1897	45,470	128,173	1920	5,450	27,825
1898	46,836	137,575	1921	8,298	43,192
1899	40,321	116,097	1922	4,624	13,570
1900	25,306	71,495	1923	2,945	11,780
1901	24,052	66,354	1924	6,040	14,922
1902	33,490	43,411	1925	2,681	10,724
1903	21,944	53,106	1926	3,863	21,577
1904	45,280	175,680	1927	3,515	17,704
1905	24,753	60,436	1928	4,966	33,832
1906	16,077	45,204	1929	3,320	14,360
1907	24,122	72,835	1930	8,525	36,075
1908	30,718	109,818			
1909	34,123	116,436	Totals	1,208,680	$3,766,427

BRICK AND HOLLOW TILE

Bibliography: State Mineralogist Reports VIII, X, XII–XV (inc.), XVII–XXVII (inc.). Bulletins 38, 99. Preliminary Report, No. 7. Cal. Jour. of Development, June, 1925, pp. 5–6.

Bricks of many varieties and in important quantities are annually produced in California, as might be expected in a state with such diversified and widespread mineral resources. The varieties include common, fire, pressed, glazed, enamel, fancy, vitrified, sand-lime, and others. Not only do the plants here supply practically all of our own requirements in these products, but considerable quantities are shipped to contiguous territory and certain products are shipped over a much wider radius. So far as possible, the different kinds have been segregated in the tabulation herewith accompanying.

We also include under this heading the various forms of hollow building 'tile' or blocks. The application of these tile to residence construction as well as to other structures is growing; though their total output for 1930 showed a slight increase in tonnage with a decreased value from the 1929 totals.

The value and amount of all kinds of brick showed a decrease in total production of 28 per cent from that of 1929.

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The detailed figures of brick and tile production for 1930, by counties, are shown in the following tabulation:

Brick and Hollow Tile Production for 1930, by Counties

County	Common		Fire		Glazed, pressed, fancy, vitrified, paving		Hollow building tile or blocks		Total value
	Amount	Value	Amount	Value	Amount	Value	Tons	Value	
Los Angeles	163,684	$1,205,620	5,513	$364,400	3,271	$107,386	28,783	$198,478	$1,875,884
Santa Barbara	940	12,680	-----	----------	-----	--------	150	2,300	14,980
Santa Clara	11,524	112,542	-----	----------	*	*	-----	--------	112,542
Alameda, Amador, Contra Costa, Fresno, Humboldt, Kern, Marin, Mendocino, Orange, Riverside, Sacramento, San Diego, San Bernardino, San Joaquin, San Luis Obispo, Tehama and Ventura*	56,238	699,219	-----	----------	-----	--------	-----	--------	669,219
Alameda, Amador, Contra Costa, Fresno, Merced, Placer, Riverside, San Diego, San Joaquin*	------	----------	15,904	835,882	-----	--------	-----	--------	835,882
Alameda, Contra Costa, Fresno, Orange, Placer, Riverside, Sacramento, San Diego, Santa Clara, Ventura*	------	----------	-----	----------	9,961	325,383	-----	--------	325,383
Alameda, Contra Costa, Fresno, Merced, Riverside, Sacramento, San Diego, San Joaquin, San Luis Obispo*	------	----------	-----	----------	-----	--------	39,114	341,570	341,570
Totals	232,370	$2,030,061	21,417	$1,200,282	13,232	$432,769	68,047	$542,348	$4,205,460

* Combined to conceal the output of a single operator in each.

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Brick and Hollow Tile Production of California, by Years.

Record of brick production in the state has been kept since 1893 by this Bureau, the figures for hollow building 'tile' or blocks being also included since 1914. The annual and total figures, for amount and value, are given in the following table:

Year	Brick, M	Hollow building blocks, tons	Value
1893	103,900	------	$801,750
1894	81,675	------	457,125
1895	131,772	------	672,360
1896	24,000	------	524,740
1897	97,468	------	563,240
1898	100,102	------	571,362
1899	125,950	------	754,730
1900	137,191	------	905,210
1901	130,766	------	860,488
1902	169,851	------	1,306,215
1903	214,403	------	1,999,546
1904	281,750	------	1,994,740
1905	286,618	------	2,273,786
1906	277,762	------	2,538,848
1907	362,167	------	3,438,951
1908	332,872	------	2,506,495
1909	333,846	------	3,059,929
1910	340,883	------	2,934,731
1911	327,474	------	2,638,121
1912	337,233	------	2,940,290
1913	358,754	------	2,915,350
1914	270,791	------	2,288,227
1915	180,538	------	1,678,756
1916	206,960	------	2,096,570
1917	192,269	29,348	2,532,721
1918	136,374	34,818	2,363,481
1919	156,328	36,026	3,087,067
1920	245,842	99,208	5,704,393
1921	238,022	67,100	5,570,875
1922	374,853	105,909	7,994,991
1923	397,754	122,534	9,738,082
1924	456,716	114,469	9,137,908
1925	361,094	105 491	7,503,976
1926	388,048	90,332	7,026,124
1927	374,111	75,116	6,516,077
1928	272,443	66,277	5,694,770
1929	327,011	66,713	5,607,410
1930	267,019	68,047	4,205,460
Totals	9,402,610	1,081,388	$125,404,895

CEMENT

Bibliography: State Mineralogist Reports VIII, IX, XII, XIV, XV, XVII, XVIII, XXI–XXVII (inc.). Bulletin 38.

Cement is the most important single structural material in the mineral output of California. During 1930 there was produced a total of 9,831,938 barrels of cement valued at $14,575,731 f.o.b. plant, being a decrease in both quantity and value from the preceding year. The 1929 output was 12,794,729 barrels valued at $21,038,565 or an average of $1.64 per barrel. The average value per barrel for 1930 was $1.48.

The 1930 production came from ten plants operating in nine counties and employing a total of 1904 men. Two plants were in operation in San Bernardino County and a single plant in each of the following counties: Calaveras, Contra Costa, Kern, Merced, Riverside, San Benito, San Mateo and Santa Barbara.

There has been an interesting parallelism in the output of the Portland cement and the crushed rock, sand and gravel industries in California. The use of concrete has been a most important development in structural work during the last 20 or 30 years, and has made possible

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the building of such great monolithic structures as our irrigation and hydro-electric power dams, as well as highway pavements and sky-scraper office buildings.

Cement Production of California, by Years.

'Portland' cement was first commercially produced in California in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco.

"The Benicia Cement Company in 1859–60 was turning out 50 to 100 barrels of cement a day and San Francisco was using about 12,000 barrels a year. The mill price of the product was then $4 a barrel. By 1865, the San Francisco rate of consumption had increased to 100,000 barrels yearly, brick buildings largely taking the place of frame structures, and the price of cement had fallen to $2.50 a barrel, about the same as it is today."[1]

The growth of the industry became rapid after 1902; since which time cement has continued to be an important factor in the industrial life of the state. Although the total cement figures, to date, are not of the same magnitude as those for gold and petroleum, it is interesting to note that the value of California's cement yield beginning with 1920 has since annually exceeded the value of her gold output.

Annual production of cement in California has been as follows:

Cement Production of California, by Years

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	$15,000	1912	6,198,634	$6,074,661
1892	5,000	15,000	1913	6,167,806	7,743,024
1893			1914	5,109,218	6,558,148
1894	8,000	21,600	1915	4,918,275	6,044,950
1895	16,383	32,556	1916	5,299,507	6,210,293
1896	9,500	28,250	1917	5,790,734	7,544,282
1897	18,000	66,000	1918	4,772,921	7,969,909
1898	50,000	150,000	1919	4,645,289	8,591,990
1899	60,000	180,000	1920	6,709,160	14,962,945
1900	52,000	121,000	1921	7,404,221	18,072,120
1901	71,800	159,842	1922	8,962,135	16,524,056
1902	171,000	423,600	1923	10,825,405	25,999,203
1903	640,868	968,727	1924	11,655,131	23,225,850
1904	969,538	1,539,807	1925	13,206,630	25,043,335
1905	1,265,553	1,791,916	1926	13,797,173	25,269,678
1906	1,286,000	1,941,250	1927	14,661,783	26,474,935
1907	1,613,563	2,585,577	1928	13,625,231	24,463,287
1908	1,629,615	2,359,692	1929	12,794,729	21,038,565
1909	3,779,205	4,969,437	1930	9,831,938	14,575,731
1910	5,453,193	7,485,715			
1911	6,371,369	9,085,625	Totals	189,851,507	$326,327,546

CHROMITE

Bibliography: State Mineralogist Reports IV, XII, XIII, XIV, XV, XVII, XVIII, XXI–XXVII (inc.). Bulletins 38, 76, 91. Preliminary Report 3. U. S. G. S., Bull. 430. Min. & Sci. Press, Vol. 114, p. 552.

Chromic iron ore or chromite to the amount of 84 short tons and recalculated to the basis of 45% Cr_2O_3, value at $1,905 f.o.b. rail shipping point, was sold in California during 1930. This was a decrease

[1] Monthly Review of Mercantile Trust Co. of Cal., Vol. XIII, No. 3, p. 55, Mar., 1924.

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from the 1929 figures, which were 327 tons and $5,025. This material came from Placer and San Luis Obispo counties with a single shipper in each, in addition there were two operators in Placer County and one in Shasta County who mined chromite but did not ship any. The grade of material shipped varied from 45% to 50% Cr_2O_3.

The political and commercial control of chromite now rests largely with England, through the ownership and sales contracts exercised by the Chrome Company (Ltd.), of London. That company controls both the Rhodesian and the New Caledonian output.

Occurrence.

Until 1916, when some shipments were made from Oregon and smaller amounts from Maryland, Wyoming and Washington, practically our only domestic production of chromite for many years came from California. From 1830 to 1870 the deposits in Maryland supplied the world's consumption.

Chromite is widely distributed in California, the principal production, thus far, having come from El Dorado, San Luis Obispo, Del Norte, Shasta, Siskiyou, Placer, Fresno, and Tuolumne counties. In 1918 a total of 29 counties contributed to the state's output. There are two main belts in California yielding this mineral, one along the Coast Ranges from San Luis Obispo County to the Oregon line, including the Klamath Mountains at the north end, and the other in the Sierra Nevada from Tulare County to Plumas County. Chromite occurs as lenses in basic igneous rocks such as peridotite and pyroxenite, and in serpentines which have been derived by alteration of such basic rocks. For the most part, so far as developments have yet shown, the lenses have proved to be small, relatively few of them yielding over 100 tons apiece. A notable exception to this was the deposit on Little Castle Creek, near Dunsmuir, from which upwards of 15,000 tons were shipped before it was exhausted. Deposits worked in Del Norte County during 1918 promise well for a large tonnage. On the whole the orebodies in the northwestern corner of the state appear to average larger in size than the chromite lenses in other parts of California.

Concentration became an accomplished fact in several localities, thus utilizing some of the disseminated and lower-grade orebodies which have been found. In fact, an important part of the 1918–1920 production of California came from that source.

Imports.

Importations of foreign chromite duty free, mainly from Rhodesia, New Caledonia and India, totaled 330,531 long tons in 1930 valued at $3,513,123, compared with 317,630 long tons in 1929 valued at $2,666,488.

Uses.

The major consumption of chromite ore is for use as a refractory lining in smelting furnaces for steel and copper. A smaller portion is used in the preparation of ferrochrome for chrome-steel alloys, and of chromium chemicals, the latest development of which is chrome plating as used in the automobile industry, on ships, and in oil refin-

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eries to protect metal surfaces from wear and erosion. It is stated that during the last five years, the sales of chromite brick and chromite cement have increased 500%, because of their replacing magnesite which is more expensive.

Total Chromite Production of California.

Production of chromite in California began, apparently, about 1874, principally in San Luis Obispo County. There was considerable activity from 1880 to 1883, inclusive, and a total of 23,238 long tons (or 26,028 short tons), valued at $329,924 was shipped from that county up to the beginning of 1887. Some ore also was shipped from the Tyson properties in Del Norte County. The tabulation herewith shows the output of chromite in California, annually, including the earliest figures so far as they are available. The figures from 1887 to date are from the records of the State Mining Bureau:

Total Chromite Production of California

Year	Tons	Value	Year	Tons	Value
1874–1876 (San Luis Obispo County)	26,028	$329,924	1909	436	$5,309
1887	3,000	40,000	1910	749	9,707
1888	1,500	20,000	1911	935	14,197
1889	2,000	30,000	1912	1,270	11,260
1890	3,599	53,985	1913	1,180	12,700
1891	1,372	20,580	1914	1,517	9,434
1892	1,500	22,500	1915	3,725	38,044
1893	3,319	49,785	1916	48,943	717,244
1894	3,680	39,980	1917	52,379	1,130,298
1895	1,740	16,795	1918	73,955	3,649,497
1896	786	7,775	1919	*4,314	97,164
1897			1920	1,770	43,031
1898			1921	347	6,870
1899			1922	379	6,334
1900	140	1,400	1923	84	1,658
1901	130	1,950	1924	350	6,700
1902	315	4,725	1925	191	3,712
1903	150	2,250	1926	393	7,063
1904	123	1,845	1927	225	5,063
1905	40	600	1928	729	15,179
1906	317	2,859	1929	327	5,025
1907	302	6,040	1930	84	1,905
1908	350	6,195	Totals	244,675	$6,457,132

* Recalculated to 45% Cr_2O_3, beginning with 1919.

GRANITE

Bibliography: State Mineralogist Reports X, XII–XXVI (inc.). Bulletin 38.

The value of the granite output in California during 1930 was $855,477 (this included a small amount of tuff and some flow volcanic rocks which were used for flagstone). This was a decrease from the 1929 production which was valued at $1,169,271.

So far as possible, granite production has been segregated in the table herewith into the various uses to which the product was put. It will be noted, however, that a portion of the output has been entered under the heading 'Unclassified' This is necessary because of the fact that some of the producers have no way of telling to what specific use their stone was put after they had quarried and sold the same in the rough.

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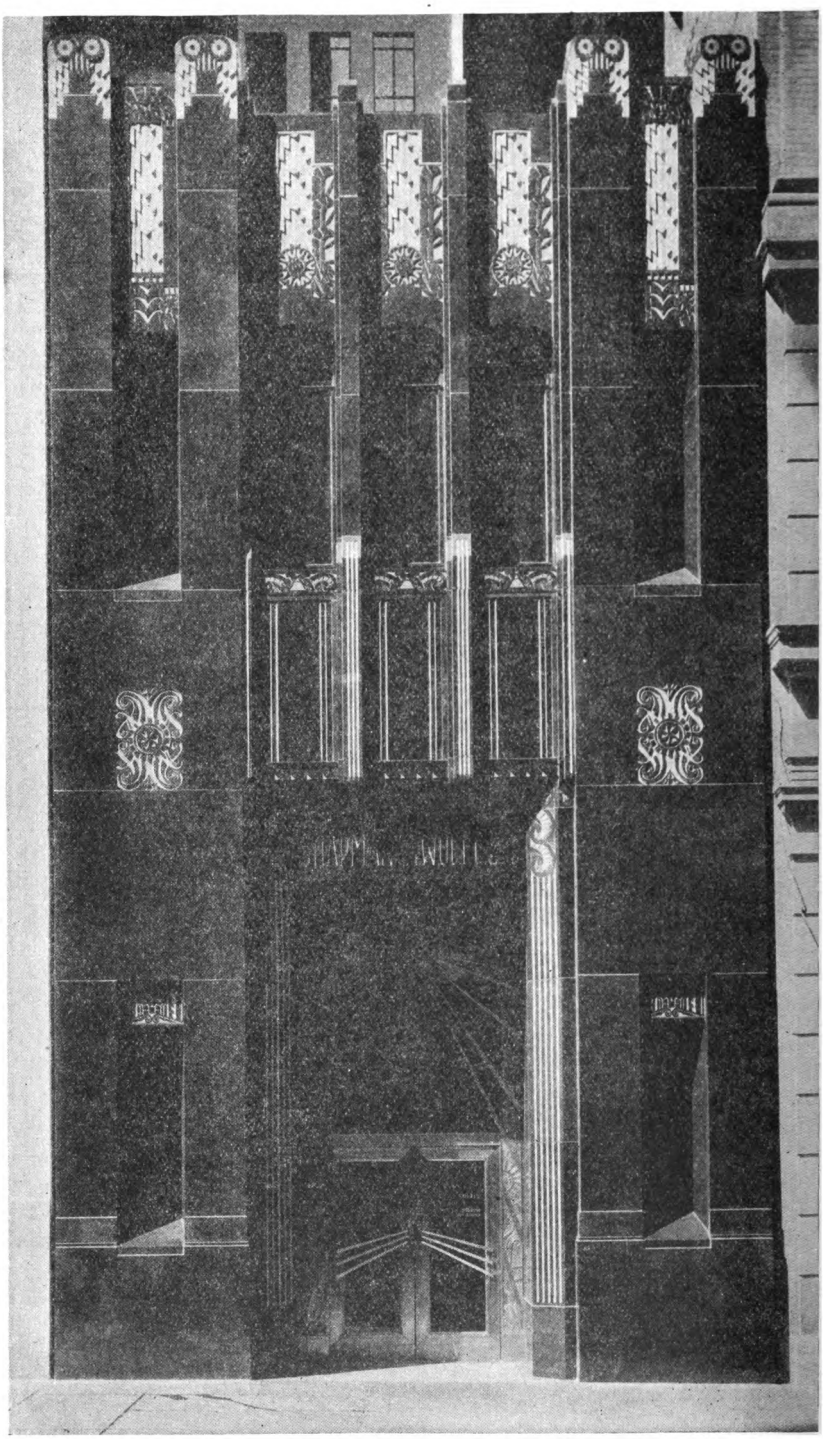

Chapman-DeWolfe Building, Faced with Porterville black granite, from the quarry of McGilvray-Raymond Corporation. W. D. Peugh, Architect.

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Granite Producers by Counties for 1930

County	Building stone		Monumental		Curbing		Unclassified		Total value
	Cubic ft.	Value	Cubic ft.	Value	Linear ft.	Value	Cubic ft.	Value	
Fresno	------	-------	13,100	$37,250	----	-----	-----	-----	$37,250
Placer	2,545	$5,041	6,701	10,800	----	-----	-----	-----	15,841
San Diego	------	-------	9,986	27,411	----	-----	-----	-----	27,411
Inyo[a], Madera, Plumas, Sacramento, San Luis Obispo[a], Tulare*	311,123	555,927	------	-------	----	-----	-----	-----	555,927
Madera, Riverside, Tulare*	------	-------	111,131	212,222	----	-----	-----	-----	212,222
Plumas, Sacramento, Siskiyou	------	-------	------	-------	1,505	$1,380	-----	-----	1,380
Lassen, Los Angeles[b], Mariposa, Placer, Sacramento, Ventura[b]*	------	-------	------	-------	----	-----	14,717	$5,446	5,446
Totals	313,668	$560,968	140,918	$287,683	1,505	$1,380	14,717	$5,446	$855,477

*Combined to conceal output of a single operator in each.
[a] Tuff used for building stone.
[b] Volcanic rock used as building stone and flagstone.

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Varieties.

For building purposes, the granites found in California, particularly the varieties from Raymond in Madera County, Rocklin in Placer County, and near Porterville in Tulare County, are unexcelled by any similar stone found elsewhere. The quantities available, notably at Raymond and Porterville, are unlimited. Most of California's 'granite,' particularly that found in the Sierra Nevada Mountains, is technically 'granodiorite' (that is, both plagioclase and orthoclase feldspars are present).

Granites of excellent quality for building and ornamental purposes are also quarried in Riverside and San Diego counties. Near Lakeside, San Diego County, there is a fine-grained, 'silver gray' granite of uniform texture and color, especially suited for monumental and ornamental work.

The Fresno County stone is a dark, hornblende diorite, locally called 'black granite,' whose color permits of a fine contrast of polished and unpolished surfaces, making it particularly suitable for monumental and decorative purposes. There is also a similar 'black granite' in Tulare County, near Success.

Granite Production of California, by Years.

The value of granite produced, annually, since 1887, has been as follows:

Year	Value	Year	Value
1887	$150,000	1910	$417,898
1888	57,000	1911	355,742
1889	1,329,018	1912	362,975
1890	1,200,000	1913	981,277
1891	1,300,000	1914	628,786
1892	1,000,000	1915	227,928
1893	531,322	1916	535,339
1894	228,816	1917	221,997
1895	224,329	1918	139,861
1896	201,004	1919	220,743
1897	188,024	1920	495,732
1898	147,732	1921	725,901
1899	141,070	1922	676,643
1900	295,772	1923	760,081
1901	519,285	1924	1,211,046
1902	255,239	1925	1,853,859
1903	678,670	1926	655,332
1904	467,472	1927	1,398,443
1905	353,837	1928	763,996
1906	344,083	1929	1,169,271
1907	373,376	1930	855,477
1908	512,923		
1909	376,834	Totals	$25,534,133

LIME

Bibliography: Reports XIV, XV, XVII–XXVII (inc.). Bulletin 38.

In California during 1930 there was an output of lime to the amount of 47,662 tons valued at $452,084, coming from two plants in Santa Cruz County and one each in El Dorado, Inyo, San Benito, San Bernardino, Siskiyou, and Tuolumne counties. The above amount was an increase in both quantity and value over the 1929 production, which was 42,834 tons worth $417,101.

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So far as we have been able to segregate the data, these figures include mainly only such lime as is used in building operations; though they do include a small proportion of calcined lime employed in agriculture and the chemical industries, the figures for which were not separable. A portion is hydrated lime. Limestone utilized in sugar making, for smelter flux, as a fertilizer, and other special industrial uses, are classified under 'Industrial Materials.' That consumed in cement manufacture is included in the value of cement.

Lime Production of California, by Years.

The following tabulation gives the amounts and value of lime produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. The figures for quantity have been recalculated from 'barrels' to 'tons' for the years 1894–1922 (inc.):

Year	Tons	Value	Year	Tons	Value
1894	37,350	$318,700	1914	43,996	$378,663
1895	39,776	386,094	1915	35,653	286,304
1896	30,275	261,505	1916	49,364	390,475
1897	28,780	252,900	1917	50,073	311,380
1898	29,786	254,010	1918	43,684	461,315
1899	29,985	314,575	1919	42,070	552,043
1900	31,252	283,699	1920	46,314	557,232
1901	31,738	334,688	1921	46,353	610 619
1902	44,866	369,616	1922	57,875	671,747
1903	49,659	418,280	1923	70,894	788,834
1904	57,945	571,749	1924	62,029	703,355
1905	61,700	555,322	1925	61,922	685,528
1906	68,927	763,060	1926	63,568	670,837
1907	68,422	756,376	1927	60,498	631,497
1908	39,639	379,243	1928	56,616	547,919
1909	52,075	577,824	1929	42,834	417,101
1910	47,951	477,683	1930	47,662	452,084
1911	42,959	390,988			
1912	52,212	464,440	Totals	1,788,046	$17,776,232
1913	61,344	528,547			

MAGNESITE

Bibliography: State Mineralogist Reports XII–XV (inc.), XVII–XXVI (inc.). Bulletins 38, 79, 91. U. S. Geol. Surv. Bulletins 355, 540. Min. Res. 1913, Pt. II, pp. 450–453. Min. & Sci. Press, Vol. 114, p. 237. "Magnesite"—Hearings before the Comm. on Ways and Means, House of Repr., on H. R. 5218, June 16, 17, and July 17, 1919. Eng. Soc. W. Penn., Proc. 1913, Vol. 29, pp. 305–388, 418–444. Eng. & Min. Jour.-Press, Vol. 114, July 29, and Dec. 2, 1922. U. S. Tariff Comm., "Crude and Caustic Calcined Magnesite. A Preliminary Statement of Information," May 19, 1926.

The production of magnesite in California during 1930 amounted to a total of 38,681 tons of crude ore valued at $388,472. Only a small part of it was sold crude, however, as it was practically all shipped in the calcined form. The reports at hand show a total of 14,653 tons shipped calcined valued at $441,780 rail shipping point; of this about 35% was dead-burned and periclase for refractory purposes, the balance going to the plastic trade. This material came from San Benito, Santa Clara, Stanislaus and Tulare counties with a single producer in each.

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From 2 to $2\frac{1}{2}$ tons of crude material are mined to make one ton of calcined.

The 1930 output showed a decrease in both quantity and value from the 1929 figures which were 47,269 tons crude valued at $488,014. The average of the values for crude reported for 1930 is $10.04 per ton compared with $10.32 in 1929, $11.00 in 1928 and $12.50 in 1927.

Occurrence.

Magnesite is a natural carbonate of magnesium, and when pure contains 52.4% CO_2 (carbon dioxide), and 47.6% MgO (magnesia). It has a hardness of 3.5 to 4.5, and specific gravity of 3 to 3.12. It is both harder and heavier than calcite (calcium carbonate), and also contains a higher percentage of CO_2 as calcite has but 44%.

Most of the Californian magnesite is comparatively pure, and is ordinarily a beautiful, white, fine-grained rock with a conchoidal fracture resembling a break in porcelain. The Grecian magnesite is largely of this character; but the Austrian varieties usually contain iron, so that they become brown after calcining. The Washington magnesite resembles dolomite and some crystalline limestones in physical appearance. Its color varies through light to dark gray, and pink.

In California the known deposits are mostly in the metamorphic rocks of the Coast Ranges and the Sierra Nevada, being associated with serpentine areas. The notable exceptions are the sedimentary deposits at Bissell in Kern County and at Afton in San Bernardino County. Several thousand tons have been shipped from the Bissell deposit; and small shipments have been made from the Afton property.

The Washington deposits are associated with extensive strata of dolomite limestone. The magnesite there appears to contain more iron than most of the California mineral, which makes it desirable for the steel operators. However, recent experience has proved that several California localities have sufficient iron in their magnesite to be serviceable in the steel furnaces.

Uses.

The principal uses include: Refractory linings for basis open-hearth steel furnaces, copper reverberatories and converters, bullion and other metallurgical furnaces; in the manufacture of paper from wood pulp; and in structural work, for exterior stucco, for flooring, wainscoting, tiling, sanitary kitchen and hospital finishing, etc. In connection with building work it has proved particularly efficient as a flooring for steel railroad coaches, on account of having greater elasticity and resilience than 'Portland' cement. For refractory purposes, the magnesite is 'dead-burned'—*i. e.*, all or practically all of the CO_2 is expelled from it. For cement purposes it is left 'caustic'—*i. e.*, from 2% to 10% of CO_2 is retained. When dry caustic magnesite is mixed with a solution of magnesium chloride ($MgCl_2$) in proper proportions, a very strong cement is produced, known as oxychloride or Sorel cement. It is applied in a plastic form, which sets in a few hours, as a tough, seamless surface. It has also a very strong bonding power, and will hold firmly to wood, metal, or concrete as a base. It may be finished with a very smooth, even surface, which will take a good wax or oil polish. As ordinarily mixed there is added a certain proportion of wood flour,

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cork, asbestos, or other filler, thereby adding to the elastic properties of the finished product. Its surface is described as 'warm' and 'quiet' as a result of the elastic and nonconducting character of the composite material. The cement is frequently colored by the addition of some mineral pigment to the materials before mixing as cement.

For refractory purposes the calcined magnesite is largly made up into bricks similar to fire-brick for furnace linings. It is also used unconsolidated, as 'grain' magnesite. For such, an iron content is desirable, as it allows a slight sintering in forming the brick. Dead-burned, pure magnesia can not be sintered except at very high temperatures; and it has little or no plasticity, so that it is hard to handle. Its plasticity is said to be improved by using with it some partly calcined or caustic magnesite. Heavy pressure will bind the material sufficiently to allow it to be sintered.

A coating of crushed magnesite is laid on hearths used for heating steel stock for rolling, to prevent the scale formed from attacking the fire-brick of the hearth.

Pure magnesite which is fused to a hard flint-like mass called 'artificial periclase,' will not shrink with additional heat and is used as a refractory for high temperatures.

Before the World War, practically all of the domestic output of caustic magnesite was used in the manufacture of pulp and paper. For this purpose calcined dolomite is now used. The use of dolomite instead of magnesite by the paper manufacturers began during the war when the price of magnesite was very high. Dolomite was found to be a good substitute for magnesite in the bisulphite process of paper making and so its use has continued.

Imports.

The tariff act of 1930 placed the following import duties on magnesite: Crude magnesite $\frac{15}{32}¢$ per lb., caustic-calcined magnesite $\frac{15}{16}¢$ per lb.; dead-burned and grain magnesite, not suitable for manufacture into oxychloride cements, $\frac{23}{40}¢$ per lb; magnesite brick $\frac{3}{4}¢$ per lb. and 10% ad valorem. The figures of imports for 1930, as published by the U. S. Bureau of Foreign and Domestic Commerce, show a total of 51,195 short tons of calcined ore, valued at $789,624, as compared with 53,182 tons and $819,219 in 1929.

Total Magnesite Production of California.

The first commercial production of magnesite in California was made in the latter part of 1886 from the Cedar Mountain district,[1] southeast of Livermore, Alameda County. Shipments amounting to 'several tons' or 'several carloads' were sent by rail to New York; but there is apparently no exact record of the amount for that first year. The statistical records of the State Mining Bureau began with the year 1887, and the table herewith shows the figures for amount and value, annually, from that time. Shipments of magnesite from Napa County began in 1891 from the Snowflake Mine; from the Red Mountain deposits in Santa Clara County, in 1899; and from Tulare County in 1900.

[1] See U. S. Geol. Surv.; Mineral Resources of U. S., 1886, pp. 6 and 696.

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Total Magnesite Production of California

Year	Tons	Value	Year	Tons	Value
1887	600	$9,000	1910	16,570	$113,887
1888	600	9,000	1911	8,858	67,430
1889	600	9,000	1912	10,512	105,120
1890	600	9,000	1913	9,632	77,056
1891	1,500	15,000	1914	11,438	114,380
1892	1,500	15,000	1915	30,271	283,461
1893	1,093	10,930	1916	154,052	1,311,893
1894	1,440	10,240	1917	209,648	1,976,227
1895	2,200	17,000	1918	83,974	803,492
1896	1,500	11,000	1919	44,696	452,094
1897	1,143	13,671	1920	83,695	1,033,491
1898	1,263	19,075	1921	47,837	511,102
1899	1,280	18,480	1922	55,637	594,665
1900	2,252	19,333	1923	73,963	946,643
1901	4,726	43,057	1924	67,236	900,183
1902	2,830	20,655	1925	64,623	872,944
1903	1,361	20,515	1926	50,915	587,642
1904	2,850	9,298	1927	46,093	577,887
1905	3,933	16,221	1928	45,645	501,590
1906	4,032	40,320	1929	47,269	488,014
1907	6,405	57,720	1930	38,681	388,472
1908	10,582	80,822			
1909	7,942	62,588	Totals	1,263,927	$13,244,598

MARBLE

Bibliography: State Mineralogist Reports XII–XV (inc.), XVII–XXVI (inc.). Bulletin 38. U. S. Bur. of Mines, Bull. 106.

The 1930 production of marble in California was valued at $82,194 (including some onyx and travertine from Solano County and a small amount of limestone used as building stone and flagstone coming from an operator each in San Luis Obispo and Santa Barbara counties). The marble came from single quarry each in Amador, Inyo, and Tuolumne counties. The 1930 output showed a decrease in value that of 1929 which was worth $93,661. During the last few years there has been a steadily increasing demand for flat stratified stones or flagstone to be used with both Spanish and English types of architecture.

California has many beautiful and serviceable varieties of marble, suitable for almost any conceivable purpose of construction or decoration. In the decorative class are deposits of onyx marble of beautiful coloring and effects. There is also serpentine marble suitable for electrical switchboard use.

Marble Production of California, by Years.

Data on annual production since 1887, as compiled by the State Mining Bureau, follows. Previous to 1894 no records of amounts were preserved.

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Total Production of Marble in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$5,000	1910	18,960	50,200
1888		5,000	1911	20,201	54,103
1889		87,030	1912	27,820	74,120
1890		80,000	1913	41,654	113,282
1891		100,000	1914	25,436	48,832
1892		115,000	1915	22,186	41,518
1893		40,000	1916	25,954	50,280
1894	38,441	98,326	1917	24,755	62,950
1895	14,864	56,566	1918	[a]17,428	49,898
1896	7,889	32,415	1919	25,020	74,482
1897	4,102	7,280	1920	[b]29,531	92,899
1898	8,050	23,594	1921	30,232	98,395
1899	9,682	10,550	1922	38,321	127,792
1900	4,103	5,891	1923	28,015	124,919
1901	2,945	4,630	1924	[b]31,579	140,253
1902	19,305	37,616	1925	35,664	116,105
1903	84,624	97,354	1926	34,806	119,999
1904	55,401	94,208	1927	[b]42,308	103,689
1905	73,303	129,450	1928	[b]34,324	82,190
1906	31,400	75,800	1929	[b]72,881	93,661
1907	37,512	118,066	1930	[b]65,775	82,194
1908	18,653	47,665			
1909	79,600	238,400	Total value		$3,311,602

[a] Includes onyx and serpentine.
[b] Includes onyx and travertine.

ONYX and TRAVERTINE

Bibliography: State Mineralogist Reports XII–XV (inc.), XVII, XVIII, XXI, XXIII. Bulletin 38.

Onyx and travertine are known to exist in a number of places in California, but there has been only a small and irregular production since the year 1896. In 1930 there were two producers of travertine in Solano County. The 1930 output showed a slight decrease in both quantity and value from that of 1929 the figures of which are combined with marble. This material is used in terrazzo, auto gear-shift handles, bases for fountain-pen desk sets, and other ornamental purposes.

Onyx Production of California, by Years.

Production by years has been as follows:

Year	Value	Year	Value
1887	$900	1920	*
1888	900	1921	$1,294
1889	900	1922	3,320
1890	1,500	1923	2,510
1891	2,400	1924	*
1892	1,800	1925	16,120
1893	27,000	1926	7,575
1894	20,000	1927	*
1895	12,000	1928	*
1896	24,000	1929	*
1918	*	1930	*
1919		Total value	$122,219

* See under Marble.

SANDSTONE

Bibliography: State Mineralogist Reports XII–XV, XVII, XVIII, XXI, XXIII, XXVI. Bulletin 38. U. S. Bur. of M., Bull. 124.

An unlimited amount of high-grade sandstone is available in California, but the wide use of concrete in buildings of every character, as

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well as the popularity of a lighter-colored building stone, has curtailed production in this branch of the mineral industry during recent years almost to the vanishing point. In 1930 a total of 160,704 cu. ft. of sandstone, valued at $56,404, was quarried in California and came from properties in Los Angeles, Monterey, Napa, Sonoma, and Tehama counties, by thirteen operators; compared with 177,655 cu. ft. valued at $49,881 in 1929. Practically all of the material was flagstone which is used in garden walks, fountains, walls and fireplaces to give effect to Spanish and English types of homes. The material reported from Monterey County is in reality an indurated shale of the Monterey series, of a cream color and utilized as a building stone; and that from Sonoma is a stratified, altered andesite having the appearance of sandstone. Part of the material coming from Los Angeles County was schist and indurated shale.

A large portion of the sandstone was sold for landscape work and used as stepping stones for walks and for fountains, walls, etc.

Sandstone Production of California, by Years.

Amount and value, so far as contained in the records of this Bureau, are presented herewith, with total value from 1887 to date:

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$175,000	1910	165,971	$80,443
1888		150,000	1911	255,313	127,314
1889		175,598	1912	66,487	22,574
1890		100,000	1913	62,227	27,870
1891		100,000	1914	111,691	45,322
1892		50,000	1915	63,350	8,438
1893		26,314	1916	17,270	10,271
1894		113,592	1917	31,090	7,074
1895		35,373	1918	900	400
1896		28,379	1919	5,400	3,720
1897		24,086	1920	10,500	2,300
1898		46,384	1921	10,150	2,112
1899	56,264	103,384	1922	900	1,100
1900	378,468	254,140	1923	7,000	13,000
1901	266,741	192,132	1924	6,700	3,600
1902	212,123	142,506	1925	14,704	14,362
1903	353,002	585,309	1926	34,100	17,500
1904	363,487	567,181	1927	22,900	205,400
1905	302,813	483,268	1928	134,100	43,250
1906	182,076	164,068	1929	177,655	49,881
1907	159,573	148,148	1930	160,704	56,404
1908	93,301	55,151			
1909	79,240	37,032	Total value		$4,499,380

SERPENTINE

Bibliography: State Mineralogist Report XV. Bulletin 38.

Serpentine has not been produced in California to a very large extent at any time. A single deposit, that on Santa Catalina Island, has yielded the principal output to date. Some material was shipped from there in 1917 and 1918, being the only output recorded since 1907. It was used for decorative building purposes and for electrical switchboards. As there was but a single operator, the figures were combined with those of marble output for those years.

Serpentine Production of California, by Years.

The following table shows the amount and value of serpentine from 1895 as recorded by this Bureau:

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Total Serpentine Production in California

Year	Cubic feet	Value	Year	Cubic feet	Value
1895	4,000	$4,000	1904	200	$2,310
1896	1,500	6,000	1905		
1897	2,500	2,500	1906	847	1,694
1898	750	3,000	1907	1,000	3,000
1899	500	2,000	1917	[a]	[a]
1900	350	2,000	1918	[b]	[b]
1901	89	890	1919		
1902	512	5,065			
1903	99	800	Totals	12,347	$33,259

[a] Under 'Unapportioned.'
[b] See under Marble.

SLATE

Bibliography: State Mineralogist Reports XV, XVIII, XXIV. Bulletin 38. U. S. Geol. Surv., Bull. 586. U. S. Bur. of Mines, Bull. 218.

Slate was first produced in California in 1889. Up to and including 1910 such production was continuous, but since then it has been irregular. Large deposits of excellent quality are known in the state, especially in El Dorado, Calaveras and Mariposa counties, but the demand has been light owing principally to competition of cheaper roofing materials.

'Slate' is a term applied to a fine-grained rock that has a more or less perfect cleavage, permitting it to be readily split into thin, smooth sheets. Varieties differ widely in color and have a considerable range in chemical and mineralogical composition. Excepting certain rare slates of igneous origin (of which the green slate of the Eureka quarry, El Dorado County, California, is an example) formed from volcanic ash or igneous dikes, slates have originated from sedimentary deposits consisting largely of clay. By consolidation, and the pressure of superimposed materials, clays become bedded deposits of shale. By further consolidation under intense pressure and high temperature incident to mountain-building forces, shales are metamorphosed to slates. The principal mineral constituents are mica, quartz, and chlorite, with smaller varying amounts of hematite, rutile, kaolin, graphite, feldspar, tourmaline, calcite, and others.

The color of slate is of economic importance. The common colors are gray, bluish gray, and black, though reds and various shades of green are occasionally found.

The permanency of slate for roofing is well known. It is stated that there are slate roofs in Pennsylvania and Maryland over 100 years old.

"In England and Wales, and in France, many buildings constructed in the 15th and 16th centuries were roofed with slate, and the roofs are still in excellent condition. There is a record of a chapel in Bedford-on-Avon in Wiltshire, England, roofed with slate in the 8th century, and after 1200 years of climatic exposure is moss-covered but in good condition." [1]

Contrary to the general impression, however, the major portion of the slate produced in the United States is used on the inside rather than the outside of buildings. Its interior uses include stationary washtubs, electrical switchboards, and blackboards.

[1] Bowles, O., Slate as a Permanent Roofing Material: U. S. Bur. of M., Reports of Investigations, Serial No. 2267, July, 1921, p. 4.

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A square of roofing slate is a sufficient number of pieces of any size to cover 100 square feet of roof, with allowance generally for a three-inch lap. The sizes of the pieces of slate making up a square range from 7 x 9 inches to 16 x 24 inches, and the number of pieces in a square ranges from 85 to 686. The Ferry Building, San Francisco, is roofed with Eureka slate from El Dorado County.

The production of slate in California for 1929 and 1930 was 8220 tons valued at $71,347 f.o.b. rail-shipping point. The 1930 figures showed a slight decrease in amount and an increased value. The annual details are concealed under 'Unapportioned' owing to a single operator in both El Dorado and Tuolumne counties. Practically all of this slate was crushed and used for roofing granules.

Total Production of Slate in California.

A complete record of amount and value of slate produced in California follows:

Year	Squares	Value	Year	Squares	Value
1889	4,500	$18,089	1907	7,000	$60,000
1890	4,000	24,000	1908	6,000	60,000
1891	4,000	24,000	1909	6,961	45,660
1892	3,500	21,000	1910	1,000	8,000
1893	3,000	21,000	1911		
1894	1,800	11,700	1915	1,000	5,000
1895	1,350	9,450	1916		
1896	500	2,500	1920	8	80
1897	400	2,800	1921		
1898	400	2,800	1922	200	2,400
1899	810	5,900	1923		
1900	3,500	26,250	1926	[a]	7,377
1901	5,100	38,250	1927	[b]2,686	17,960
1902	4,000	30,000	1928	[b]4,075	31,263
1903	10,000	70,000	1929 } *	8,220	71,347
1904	6,000	50,000	1930 }		
1905	4,000	40,000			
1906	10,000	100,000	Total value		$806,820

* Annual details concealed under 'Unapportioned.'

MISCELLANEOUS STONE

Bibliography: State Mineralogist Reports XII–XXVII (inc.). Bulletin 38; also annual statistical bulletins from 1915 to date.

'Miscellaneous stone' is the name used throughout this report as the title for that branch of the mineral industry covering crushed rock of all kinds, paving blocks, sand and gravel, and pebbles for grinding mills. The foregoing are very closely related from the standpoint of the producer; therefore it has been found to be most satisfactory to group these items as has been done in recent reports of this Bureau. So far as it has been possible to do so, crushed rock production has been subdivided into the various uses to which the product was put. It will be noted, however, a very large percentage of the output has been tabulated under the heading 'Unclassified.' This is necessary because of the fact that many of the producers have no way of telling to what specific use their rock was put (or at least the proportions to each use) after they have quarried and sold the same to distributors and contractors.

In addition to amounts produced by commercial firms, both corporations and individuals, there is hardly a county in the state but uses

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more or less gravel and broken rock on its roads. Of much of this, particularly in the country districts, there is no definite record kept.

The production in California of sand and gravel for the year 1930 showed a decrease in tonnage with an increased value over the previous year, although crushed rock showed decreases in both amount and value. This resulted in a total of $16,430,027 for 'miscellaneous stone' during 1930 as compared with $17,804,159 in 1929.

As for several years past Los Angeles County led all counties by a wide margin, with an output valued at $4,731,302 (compared with $5,335,300 in 1929); followed by Alameda second with $1,436,608; Calaveras third with $818,507; San Diego fourth with $651,926; San Benito fifth with $509,010; followed by Kern, Santa Clara, San Bernardino, Butte, Contra Costa, Amador, Sacramento, San Mateo, Imperial, in order named.

Paving Blocks.

During 1930 there was a small production of paving blocks in California coming from a property each in Los Angeles and Monterey counties. The annual details are concealed under the 'Unapportioned' item to conceal the output of either operator.

The paving block industry has decreased materially of recent years, practically to the vanishing point, because of the increased construction of smoother pavements demanded by motor vehicle traffic. The blocks made in Solano County were of basalt; those from Sonoma are of basalt, andesite, and some trachyte, while those from Madera, Placer, Riverside, San Bernardino, and San Diego are of granite; and those from San Mateo County a sandstone.

The amount and value of paving block production, annually, since 1887 has been as follows:

Year	Amount M	Value	Year	Amount M	Value
1887	*10,000	$350,000	1910	4,434	198,916
1888	10,500	367,500	1911	4,141	210,819
1889	7,303	297,236	1912	11,018	578,355
1890	7,000	245,000	1913	6,364	363,505
1891	5,000	150,000	1914	6,053	270,598
1892	*3,000	96,000	1915	3,285	171,092
1893	2,770	96,950	1916	1,322	54,362
1894	2,517	66,981	1917	938	38,567
1895	2,332	73,338	1918	372	17,000
1896	4,161	77,584	1919	27	1,350
1897	1,711	35,235	1920	63	3,155
1898	1,144	21,725	1921	4	280
1899	305	7,861	1922	72	3,924
1900	1,192	23,775	1923	15	880
1901	1,920	41,075	1924	11	935
1902	3,502	112,437	1925	27	1,350
1903	4,854	134,642	1926		
1904	3,977	161,752	1927	41	2,057
1905	3,408	134,347	1928	25	1,658
1906	4,203	173,432	1929		
1907	4,604	199,347	1930	[a]	[a]
1908	7,660	334,780			
1909	4,503	$199,803	Totals	135,768	$5,319,603

* Figures for 1887–1892 (inc.) are for Sonoma County only, as none are available for other counties during that period though Solano County quarries were then also quite active.

[a] Annual details concealed under 'Unapportioned.'

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Grinding Mill Pebbles.

Production of pebbles for tube and grinding mills began commercially in California in 1915. Owing to the decreased imports and higher prices of Belgium and other European flint pebbles, due to the war, there was a serious inquiry for domestic sources of supply. In 1916 and 1917 shipments totaled in excess of 20,000 tons per year; but they have since dropped to an insignificant figure. San Diego County has been the principal contributor, with some also from Fresno and Sacramento. Shipments have been made to metallurgical plants in California, Nevada, Montana and Utah. The material produced in recent years has been used in silex-lined mills for grinding clay, silica or feldspar, etc., where iron can not be present.

Imports to the United States in 1930 amounted to 6121 long tons, valued at $62,463, as compared with 12,542 long tons, valued at $127,186 in 1929.

The 1930 output of grinding mill pebbles in California was concealed under 'Unapportioned' to conceal the production of a single operator in San Diego County.

The amount and value of grinding mill pebbles, annually, follows:

Year	*Tons*	*Value*
1915	340	$2,810
1916	20,232	107,567
1917	21,450	90,538
1918	8,628	61,268
1919	2,607	19,272
1920	2,104	17,988
1921	247	1,418
1922	1,571	7,628
1923	2,650	14,936
1924	434	2,969
1925	215	1,385
1926	102	612
1927	288	1,800
1928	372	2,408
1929 } 1930 }*	166	1,225
Totals	61,406	$263,824

* Annual details concealed under 'Unapportioned.'

Sand and Gravel.

A considerable part of the gravel excavated is passed through grading and washing plants, and the material over 2 inches in size is crushed. Much of it is utilized in concrete mixtures. Most of the gravel used for road surfacing and repairs as well as that for railroad ballast is creek-run or pit-run material which is spread upon the roads without undergoing any grading or washing.

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The distribution of the 1930 output of sand and gravel, by counties, is given in the following table:

County	*Tons*	*Value*	*County*	*Tons*	*Value*
Alameda	[a] 1,934,124	$1,160,198	San Bernardino	385,872	$225,853
Butte	437,605	144,902	San Diego	[a] 497,559	413,325
Calaveras	9,450	14,003	San Joaquin	220,683	196,857
Colusa	49,500	45,900	San Luis Obispo	[a] 33,186	17,409
Contra Costa	[a] 110,529	78,654	Santa Barbara	141,504	81,067
Del Norte	43,069	53,475	Santa Clara	330,504	225,089
El Dorado	1,372	3,575	Santa Cruz	100,003	68,220
Glenn	202,531	61,179	Shasta	53,360	106,283
Humboldt	224,714	93,185	Sierra	6,580	6,065
Imperial	136,915	74,962	Siskiyou	143,571	35,416
Inyo	1,720	1,000	Sonoma	312,476	155,927
Kern	[b] 77,046	38,050	Stanislaus	221,831	133,022
Lake	41,725	47,779	Tehama	32,384	49,000
Los Angeles	[cd] 5,564,963	2,914,583	Trinity	1,935	4,238
Mariposa	7,225	4,933	Tulare	140,467	58,350
Mendocino	74,851	48,007	Ventura	[a] 232,537	140,987
Merced	63,082	23,250	Yolo	42,100	27,000
Mono	30,098	18,294	Alpine, Amador, Fresno, Kings, Madera, Marin, Modoc, San Mateo[a], Yuba*	170,942	100,691
Monterey	[a] 170,924	187,421			
Napa	26,115	25,133			
Orange	291,569	160,576			
Placer	7,020	5,030			
Plumas	21,000	51,000			
Riverside	[a] 153,617	120,937	Totals	12,956,157	$7,562,473
Sacramento	207,899	141,648			

* Combined to conceal output of a single operator in each.
[a] Includes molding sand.
[b] Includes earth.
[c] Includes blast sand.
[d] Includes sand for roofing granules.

Included in the above is a total of 49,617 tons of molding sand valued at $110,960, coming from two properties in each Contra Costa, Monterey, Riverside, and San Diego counties, and one each in Alameda, San Luis Obispo, San Mateo and Ventura counties. This item is each year assuming a more important position in the commercial mineral list of California. The 1929 figures were 58,296 tons worth $127,135.

Crushed Rock.

To list the kinds and varieties of rock utilized commercially under this heading would be to run almost the entire gamut of the classification scale. Much depends on the kind available in a given district. Those which give the most satisfactory service are the basalts and other hard, dense, igneous rocks which break with sharp, clean edges. In many localities, river-wash boulders form an important source of such material. In such cases, combined crushing and washing plants obtain varying amounts of sand and gravel along with the crushed sizes. In Sacramento and Butte counties the tailings piles from the gold dredgers are the basis of like operations.

The values given are based on the selling price, f.o.b. cars, barges, or trucks, at the quarry.

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Crushed Rock Production, by Counties, for 1930

County	Macadam and ballast		Rubble and riprap		Concrete		Unclassified		Total	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Alameda	112,824	$70,737	-------	-------	68,985	$87,835	152,623	$117,838	334,432	$276,410
Amador	3,546	1,879	-------	-------	74,000	83,250	800,000	300,000	877,546	385,129
Butte	349,075	232,737	-------	-------	-------	---------	[a]28,400	22,600	377,475	255,337
Calaveras	38,310	75,550	967,000	$495,000	*	*	*	*	1,005,310	570,550
Contra Costa	102,194	74,025	20,647	24,034	85,890	86,643	155,236	135,257	363,967	319,959
Del Norte	60,477	121,752	-------	-------	-------	---------	-------	---------	60,477	121,752
El Dorado	94,244	93,024	-------	-------	-------	---------	-------	---------	94,244	93,024
Fresno	171,312	126,515	-------	-------	*	*	*	*	171,312	126,515
Humboldt	104,099	169,840	-------	-------	-------	---------	-------	---------	104,099	169,840
Imperial	50,174	27,862	*	*	*	*	*	*	50,174	27,862
Inyo	131,931	240,238	*	*	*	*	[a, b]25,687	69,187	157,618	309,425
Kern	288,388	355,857	-------	-------	*	*	6,574	6,444	294,962	362,301
Lake	6,960	10,280	-------	-------	-------	---------	-------	---------	6,960	10,280
Lassen	68,400	14,600	-------	-------	-------	---------	-------	---------	68,400	14,600
Los Angeles	[d]302,413	291,563	19,275	27,200	381,963	304,855	[d]1,731,738	1,193,101	2,435,389	1,816,719
Mendocino	62,684	70,503	1,378	919	-------	---------	-------	---------	64,062	71,422
Mono	492	1,476	-------	-------	-------	---------	-------	---------	492	1,476
Monterey	38,100	46,550	-------	-------	-------	---------	-------	---------	38,100	46,550
Napa	58,176	34,384	-------	-------	-------	---------	*	*	58,176	34,384
Nevada	52,400	76,850	-------	-------	-------	---------	-------	---------	52,400	76,850
Orange	-------	---------	-------	-------	-------	---------	[d]160,041	91,925	160,041	91,925
Placer	102,818	123,500	4,486	4,809	-------	---------	-------	---------	107,304	128,309
Plumas	44,150	55,400	1,000	500	-------	---------	-------	---------	45,150	55,900
Sacramento	10,234	5,117	-------	-------	-------	---------	*	*	10,234	5,117
San Bernardino	64,874	41,585	67,692	45,500	-------	---------	[b]33,748	93,974	166,314	181,059
San Diego	28,783	28,291	10,272	13,349	13,159	18,470	222,457	178,491	274,671	238,601
San Luis Obispo	11,250	11,250	-------	-------	-------	---------	-------	---------	11,250	11,250
San Mateo	213,357	189,324	-------	-------	21,088	22,066	84,940	113,500	319,385	324,890
Santa Barbara	29,580	36,500	28,950	58,524	-------	---------	*	*	58,530	95,024
Santa Clara	-------	---------	-------	-------	-------	---------	223,826	184,629	223,826	184,629
Shasta	[c]212,377	122,495	-------	-------	-------	---------	-------	---------	242,377	122,495
Sierra	16,700	9,200	-------	-------	-------	---------	-------	---------	16,700	9,200
Siskiyou	37,650	49,610	50	75	-------	---------	1,000	750	38,700	50,435
Sonoma	12,039	12,780	130	100	*	*	*	*	12,169	12,880
Stanislaus	3,345	7,030	-------	-------	-------	---------	[b]43,304	40,327	46,649	47,357
Tehama	82,850	169,300	-------	-------	-------	---------	-------	---------	82,850	169,300
Tulare	-------	---------	*	*	2,200	8,150	-------	---------	2,200	8,150
Tuolumne	3,900	5,220	-------	-------	-------	---------	*	*	3,900	5,220
Riverside, San Benito, San Francisco, San Joaquin*	583,310	447,105	-------	-------	-------	---------	-------	---------	583,310	447,105
Imperial, Inyo, Marin, Riverside, Tulare*	-------	---------	186,989	168,864	-------	---------	-------	---------	186,989	168,864

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Calaveras, Fresno, Imperial, Inyo, Kern, Marin, San Benito, San Francisco, Santa Cruz, Sonoma, Ventura, Yuba*	-------	-------	-------	-------	436,639	436,673	-------	-------	436,639	436,673
Calaveras[b], Fresno, Imperial[b], Marin, Mariposa[b], Merced, Napa, Riverside, Sacramento[d], San Joaquin, Santa Barbara, Santa Cruz, Solano, Sonoma, Tuolumne[ab], Ventura*	-------	-------	-------	-------	-------	-------	913,228	982,786	913,228	982,786
Totals	3,583,416	$3,449,929	1,307,869	$838,874	1,083,924	$1,047,942	4,582,802	$3,530,809	10,558,011	$8,867,554

* Combined to conceal the output of a single operator in each.
[a] Includes granules for terrazo.
[b] Includes granules for roofing.
[c] Includes slag.
[d] Includes decomposed granite.

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Miscellaneous Stone Production of California, by Years.

The amount and value, annually, of crushed rock (including macadam, ballast, rubble, riprap, and that for concrete), and sand and gravel, since 1893, follow:

Crushed Rock, Sand and Gravel, by Years

Year	Tons	Value	Year	Tons	Value
1893	371,100	$456,075	1913	9,817,616	$4,823,056
1894	661,900	664,838	1914	9,288,397	3,960,973
1895	1,254,688	1,095,939	1915	10,879,497	4,609,273
1896	960,619	839,884	1916	9,951,089	4,009,59[illegible]
1897	821,123	600,112	1917	8,069,271	3,505,662
1898	1,177,365	814,477	1918	6,641,144	3,325,88[illegible]
1899	964,898	786,892	1919	6,919,188	3,678,322
1900	789,287	561,642	1920	9,792,122	6,782,414
1901	530,396	641,037	1921	10,914,145	7,834,54[illegible]
1902	2,056,015	1,249,529	1922	13,049,644	10,366,23[illegible]
1903	2,215,625	1,673,591	1923	19,840,301	15,379,83[illegible]
1904	2,296,898	1,641,877	1924	21,451,129	15,962,47[illegible]
1905	2,624,257	1,716,770	1925	23,819,137	17,407,113
1906	1,555,372	1,418,406	1926	24,987,606	19,859,261
1907	2,288,888	1,915,015	1927	25,126,691	18,912,994
1908	3,998,945	3,241,774	1928	27,471,794	17,328,044
1909	5,531,561	2,708,326	1929	27,104,618	17,840,159
1910	5,827,828	2,777,690	1930	23,514,168	16,430,027
1911	6,487,223	3,610,357			
1912	8,044,937	4,532,598	Totals	319,096,482	$224,962,796

A comparison of the above table of annual production of these materials with the similar table for cement (see *ante*) reveals the fact that the important growth of the crushed rock and gravel business has been coincident with the rapid development of the cement industry from the year 1902.

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CHAPTER FIVE

INDUSTRIAL MATERIALS

Bibliography: State Mineralogist Reports XII-XXVII (inc.). Bulletin 38. Min. & Sci. Press, Vol. 114, March 10, 1917. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. See also under each substance.

The following mineral substances have been arbitrarily arranged under the general heading of 'Industrial Materials,' as distinguished from those which have a clearly-defined classification, such as metals, salines, structural materials, etc.

These materials, many of which are mineral earths, are, with four or five exceptions, as yet produced on a comparatively small scale. The possibilities of development along several of these lines are large, and with increasing transportation and other facilities, together with steadily growing demands, the future for this branch of the mineral industry in California is promising. There is scarcely a county in the state but might contribute to the output.

Up to within the last few years, at least, production has been in the majority of instances dependent upon more or less of a strictly local market, and the annual tables show the results of such a condition, not only in the widely-varying amounts of a certain material produced from year to year, but in widely-varying prices of the same material.

The more important of these minerals thus far exploited, so far as shown by value of the output, are barytes, clay (pottery), diatomaceous earth, dolomite, fuller's earth, gypsum, limestone, mineral water, pyrite, sillimanite, soapstone and talc.

This group as a whole showed a decrease in the total value from $7,581,743 in 1929, to $7,168,522, in 1930.

The following table gives the comparative figures for the amounts and value of industrial minerals produced in California during the years 1929 and 1930.

Substance	1929		1930		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Barytes	26,796 tons	$168,829	19,783 tons	$133,107	$35,722—
Clay (pottery)	839,949 tons	1,127,517	938,536 tons	795,517	332,000—
Dolomite	58,644 tons	156,928	35,721 tons	106,813	50,115—
Feldspar	13,327 tons	78,404	5,014 tons	35,654	42,750—
Fuller's earth	15,541 tons	170,563	12,522 tons	177,964	7,401+
Gems		26,850		3,540	23,310—
Gypsum	140,844 tons	396,951	116,865 tons	243,507	153,444—
Limestone	168,315 tons	557,617	169,477 tons	508,751	48,866—
Mineral paint	467 tons	2,820	*	*	*
Mineral water	27,032,083 gal.	2,040,615	37,354,111 gal.	2,870,663	830,048+
Pumice and volcanic ash	10,449 tons	76,123	12,947 tons	128,847	52,724+
Pyrite	79,169 tons	363,717	39,954 tons	194,228	169,489—
Silica (sand and quartz)	18,686 tons	79,210	17,802 tons	71,380	7,830—
Soapstone and talc	18,676 tons	193,493	15,861 tons	154,258	39,235—
Unapportioned		[a]2,142,106		[b]1,744,293	397,813—
Total value		$7,581,743		$7,168,522	
Net decrease					$413,221

*Under Unapportioned.
[a] Includes asbestos, diatomaceous earth, mica, sillimanite-andalusite-cyanite group and sulphur.
[b] Includes asbestos, diatomaceous earth, mineral paint, sillimanite-andalusite-cyanite group and sulphur.

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ASBESTOS

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During 1930 there was a small tonnage of short fiber chrysotile asbestos ore mined in Monterey County, from which fiber was produced, also shipment of amphibole asbestos from two properties in Riverside County, both of which were operated by the same party. The figures are concealed under the 'Unapportioned' item to conceal the output of either operator. The 1929 output was the amphibole variety and came from Shasta County.

The future of asbestos mining in California is dependent largely upon the development of uses in quantity for the short-fibre mill grades, and for the amphibole variety. There are apparently large resources of such material that can be made available. Some spinning-grade fibre has also been found in this state, notably in Nevada, Calaveras, and Monterey counties, but the commercial yield to date has been small. There are extensive serpentine areas in the Coast Ranges, in the Klamath Mountains, and in several sections of the Sierra Nevada which are within the range of possible asbestos producers, as chrysotile is a fibrous form of serpentine. These localities all yielded chromite in greater or less amounts during the World War period.

Three-quarters of the world's supply of asbestos was for many years produced by Canada.

At present, Rhodesia furnishes 60 per cent of the long fibre, though Canada in addition to its long fibre still accounts for practically the entire output of lower grades.

Asbestos Production of California, by Years.

Total amount and value of asbestos production in California since 1887, as given in the records of this Bureau, are as follows:

Year	Tons	Value	Year	Tons	Value
1887	30	1,800	1910	200	$20,000
1888	30	1,800	1911	125	500
1889	30	1,800	1912	90	2,700
1890	71	4,260	1913	47	1,175
1891	66	3,960	1914	51	1,530
1892	30	1,830	1915	143	2,860
1893	50	2,500	1916	145	2,380
1894	50	2,250	1917	136	10,225
1895	25	1,000	1918	229	9,903
1896			1919*	131	6,240
1897			1920*		
1898	10	200	1921	410	19,275
1899	30	750	1922	50	1,800
1900	50	1,250	1923	20	200
1901	110	4,400	1924	70	4,750
1902			1925*	25	1,650
1903			1926*		
1904	10	162	1927*	13	1,160
1905	112	2,625	1928*		
1906	70	3,500	1929*	219	6,175
1907	70	3,500	1930*		
1908	70	6,100			
1909	65	6,500	Totals	3,083	$142,710

*Annual details concealed under 'Unapportioned.'

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BARYTES

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII, XXI, XXVI, (inc.). Bulletins 38, 87. Eng. & Min. Jour.-Press, Vol. 114, p. 109, July 15, 1922; Vol. 115, pp. 319–324, Feb. 17, 1923. U. S. Bureau of Mines, Inform. Circ. 6221, 6223.

Commercial shipments of crude barytes in California for 1930 amounted to a total of 19,783 short tons, valued at $133,107 f.o.b. rail shipping point. This was a decrease in both quantity and value from the figures of 1929 which were 26,796 short tons and $168,829. The 1930 yield came from two properties in San Bernardino County and a single property each in Inyo, Mariposa, Nevada, and Santa Barbara counties. This material was consumed in the manufacture of lithopone, as heavy-gravity oil-well drilling mud and barium chemicals. The mining of barytes has been showing a steady increase with 1929 showing the largest annual production.

More than half of the total tonnage of barytes utilized in the United States is taken in the manufacture of lithopone, which is a chemically-prepared white pigment containing approximately 70% barium sulphate and 30% zinc sulphide. This is one of the principal constituents of 'flat' wall paints. Other important uses for barytes, after washing and grinding, are as an inert pigment and filler in paint, paper, linoleums, oilcloth and rubber manufacture, and in the preparation of a number of chemicals including barium binoxide, carbonate, chloride, nitrate, and the sulphate precipitated, or 'blanc fixe.'

The Tariff Act of 1930 placed a duty on foreign imported barytes ore, crude or unmanufactured, of $4 per ton; ground or otherwise manufactured, of $7.50 per ton.

Present quotations for barytes (93% $BaSO_4$) vary from $7 to $7.75 per ton, crude, f.o.b. rail-shipping point. Most baryte has to be washed and acid treated to remove iron stains or other impurities before being suitable for paint use.

Known occurrences of this mineral in California are located in Inyo, Los Angeles, Mariposa, Monterey, Nevada, San Bernardino, Shasta and Santa Barbara counties. The deposits at El Portal, in Mariposa County, have given the largest commercial production to date, in part witherite (barium carbonate, $BaCO_3$). Witherite has also been found in Shasta County, but no shipments have yet been made from the deposit.

Total Barytes Production of California.

The first recorded production of barytes in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910	860	$5,640	1922	3,370	$18,925
1911	309	2,207	1923	2,925	16,058
1912	564	2,812	1924		
1913	1,600	3,680	1925		
1914	2,000	3,000	1926	4,978	38,165
1915	410	620	1927	17,993	90,617
1916	1,606	5,516	1928	13,406	55,888
1917	4,420	25,633	1929	26,796	168,829
1918	100	1,500	1930	19,783	133,107
1919	1,501	18,065			
1920	3,029	20,795	Totals	106,551	$615,866
1921	901	4,809			

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CLAY (Pottery)

Bibliography: State Mineralogist Reports I, IV, IX, XII–XV, XVIII–XXVI (inc.). Bulletins 38, 99. Preliminary Report No. 7. U. S. Bureau of Standards, Tech. Paper No. 262.

At one time or another in the history of the state, pottery clay has been mined in thirty-three of its counties. Of these, 20 contributed in 1930. In this report, 'pottery clay' refers to all clays used in the manufacture of red and brown earthenware, china and sanitary ware, flower pots, floor, faience and ornamental tiling, architectural terra cotta, sewer pipe, drain and roof tile, etc., and the figures for amount and value are relative to the crude material at the pit, without reference to whether the clay was sold in the crude form or was immediately used in the manufacture of any of the above finished products by the producer. It does not include clay used in making brick and hollow building blocks.

There are many other important uses for clay besides pottery manufacture. Among these may be enumerated paper, cotton goods, and chemicals. Being neutral, clay does not have an injurious effect upon other constituents used in the manufacture of such articles. In paper making, clay is used as a filler in news and similar grades, and as a coater or glazer in the more highly-finished art papers. A large part of the china clay used in the United States is imported from England. Clays of the montmorillonite and halloysite group ('rock soap') are being utilized successfully in the manufacture of soaps and for filtering oils and as oil-well drilling mud, also as an earth filler in irrigating ditches which run through porous ground.

During 1930 a total of 72 properties in 20 counties reported an output of 938,586 short tons of pottery clay, having a total value of $795,517 f.o.b. rail shiping point for crude material, as compared with 839,949 tons and $1,127,517 in 1929. The large decrease in average price per ton is accounted for by the increase in material used in oil-well drilling mud and a decrease in that which is used in the manufacture of ceramics.

Because of the fact that a given product often requires a mixture of several different clays, and that these are not all found in the same pit, it is necessary for most clay-working plants to buy some part of their raw materials from other localities. For these reasons, in compiling the clay industry figures, much care is required to avoid duplications. So far as we have been able to segregate the figures, from the data sent in by the operatives, we have credited the clay output to the counties from which the raw material originated; and have deducted tonnages used in brick manufacture, as bricks are classified separately, herein.

A tabulation of the direct returns from the producers, by counties, for the year 1930 is shown herewith:

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Pottery Clay, in 1930

County	Tons	Value	Used in the manufacture of
Alameda	10,103	$20,063	Architectural terra cotta; chimney, drain and sewer pipe; faience, floor, decorative, and roofing tile; garden furniture, electrical, porcelain and various.
Amador	74,023	103,160	Architectural terra cotta; fire clay products and refractories; chimney drain and sewer pipe; floor mantle and roofing tile and various.
Kern	[a]371,123	117,834	Oil well and rotary drilling mud.
Los Angeles	78,643	70,693	Architectural terra cotta; conduits and segment blocks, electrical porcelain, red earthenware, refractories, chimney, drain and sewer pipe; faience, floor mantle and roofing tile; art pottery and various.
Orange	18,224	78,366	Stone ware, refractories, faience, drain floor and mantle tile and various.
Placer	85,377	116,642	Architectural terra cotta; chimney, drain and sewer pipe, faience, floor, mantle and roofing. Red earthenware, refractories and various.
Riverside	102,419	180,727	Conduit, sewer and drain-pipe. Red earthenware, faience, floor, mantle and roofing tile and various.
San Bernardino	2,013	14,916	Floor and roofing tile; stone ware, sanitary ware, art pottery, refractories and various.
San Diego	15,517	25,785	Sewer and drain pipe; faience, floor and roofing tile; refractories, sanitary ware and various.
Santa Barbara	150	87	Drain pipe, floor and roooofing tile and various.
Santa Clara	3,607	2,259	Sewer pipe, art pottery, drain, faience, floor, mantle and roofing tile and various.
Contra Costa, Humboldt, Inyo,[b] Merced, Monterey, Sacramento, San Luis Obispo, Stanislaus and Ventura.[a]*	177,387	64,985	Architectural terra cotta; chimney drain and sewer pipe; flue lining, faience, floor, mantle and roofing tile; refractories, electrical porcelain, oil-well drilling mud and various.
Totals	938,586	$795,517	

* Combined to conceal the output of a single operator in each.
[a] Includes clay and shale for oil-well mudding.
[b] Includes bentonite used in filling porous ground in irrigating ditches.

Pottery Clay Products.

The values of the various pottery clay products made in California during 1930 totaled $12,014,535 as compared with $14,452,889 in 1929, their distribution being shown in the following tabulation:

Product	*Number of producers*	*Tons*	*Value*
Architectural terra cotta	5	------	$731,402
Chimney pipe and flue lining	8	10,294	754,392
Drain pipe	17	10,383	155,788
Sewer pipe	8	66,182	1,723,411
Roofing	32	119,307	1,404,205
Electrical porcelain	6	------	500,041
Red earthenware	9	------	197,372
Stoneware and chemical stoneware	7	------	364,504
Chinaware and semivitreous tableware	4	------	439,642
Sanitary ware and plumbing	7	------	1,939,080
Garden furniture	3	------	91,442
Floor, faience, mantel and handmade tile	34	------	2,716,623
Ground fire clay and high temperature cement	7	4,693	80,895
Specialties	4	------	27,347
Miscellaneous: chimney tops, art pottery and decorative tiles, stove radiants, clay shapes, tank backs, wall coping, bath tile, molding clay, electrical conduits, red vents, trimmed tile, refractory shapes, grog and various	23	------	888,391
Total value			$12,014,535

Important increases were shown by electrical porcelain, drain pipe, and stoneware. All other groups showed a decrease in value from 1929 totals.

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Pottery Clay Production of California, by Years.

Amount and value of crude pottery clay output in California sinc 1887 are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	75,000	$37,500	1910	249,028	$324,0
1888	75,000	37,500	1911	224,576	252,7
1889	75,000	37,500	1912	199,605	215,5
1890	100,000	50,000	1913	231,179	261,2
1891	100,000	50,000	1914	179,948	167,5
1892	100,000	50,000	1915	157,866	133,7
1893	24,856	67,284	1916	134,636	146,5
1894	28,475	35,073	1917	166,298	154,9
1895	37,660	39,685	1918	112,423	166,7
1896	41,907	62,900	1919	135,708	245,0
1897	24,592	30,290	1920	203,997	440,5
1898	28,947	33,747	1921	225,120	362,1
1899	40,600	42,700	1922	277,232	473,1
1900	59,636	60,956	1923	376,863	697,8
1901	55,679	39,144	1924	417,928	651,8
1902	67,933	74,163	1925	537,587	674,0
1903	90,972	99,907	1926	801,461	806,5
1904	84,149	81,952	1927	867,419	872,6
1905	133,805	130,146	1928	887,807	1,394,9
1906	167,267	162,283	1929	839,949	1,127,5
1907	160,385	254,454	1930	938,586	795,5
1908	208,042	325,147			
1909	299,424	465,647	Totals	10,244,545	$12,633,2

DIATOMACEOUS EARTH

Bibliography: State Mineralogist Reports II, XII–XV (inc.). XVII–XXVI (inc.). Bulletins 38, 67, 91. Am. Inst. Min Eng. Bull., 104, August, 1915, pp. 1539–1550. U. S. Bur. o Mines, Rep. of Investigations: Serial No. 2431, Jan., 1923. Eng & Min. Jour.-Press, Vol. 115, pp. 1152–1154, June 30, 1923.

Infusorial and diatomaceous earths—sometimes called tripolite—ar very light and extremely porous, chalk-like materials composed of pur silica (chalk, being calcareous) which have been laid down under wate and consist of the remains of microscopical infusoria and diatoms The former are animal remains, and the latter are from plants. Th principal commercial use of diatomaceous earth (also called 'diatomite' is as a cement admixture. It is also employed in the manufacture o scouring soap and polishing powders; for filtration purposes; in makin some classes of refractory brick; and as an insulating medium both i heating and refrigeration, also sound-proofing. It is a first-class non conductor of heat, where high temperatures are employed, such a around steel and gas plants and power houses. In such cases, it is built in as an insulating layer in furnace walls. In Germany, under the name 'kieselguhr,' is was used as an absorbent for nitroglycerine in the early manufacture of dynamite.

As a nonconductor of heat it has been used alone or with other mate rials as a covering for boilers, steam pipes and safes, and in fireproof cement. It is used largely by paint manufacturers as a wood filler. Boiled with shellac it is made into records for talking machines. It has been used for absorbing liquid manures so that they could be utilized as fertilizers, and as a source of silica in making water-glass as well as in the manufacture of cement, tile glazing, artificial stone, ultramarine and other pigments of aniline and alizarine colors, paper filling, sealing wax, fireworks, hard-rubber objects, matches, and papier maché, and

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for solidifying bromine. For making insulating brick the material is sawed into blocks, and for all other purposes it is ground and screened.

The most important deposits in California thus far known are located in Monterey, Orange, San Luis Obispo, and Santa Barbara counties. The Santa Barbara material is diatomaceous and is of a superior quality, particularly for filtration uses which bring the higher prices. Infusorial or diatomaceous earths are also found in Fresno, Kern, Los Angeles, Plumas, San Benito, San Bernardino, San Joaquin, Shasta, Sonoma, and Tehama counties.

As about 85 per cent of the California output is from a single operator, we have concealed the exact figures under the 'Unapportioned' item in the state and county totals. There were six operators during 1930 in Fresno, Los Angeles, Monterey, and Santa Barbara counties. The shipments during the year showed a slight decrease in total tonnage and value compared with 1929.

The material shipped was utilized for insulation of both heat and sound, filtration, paint, pigment, cement admixture, fillers, abrasives and for clarification of gasoline and kerosene.

Total Production of Diatomaceous Earth in California.

The first recorded production of these materials in California occurred in 1889; total amount and value of output, to date, are as follows:

Year	Tons	Value	Year	Tons	Value
1889	39	$1,335	1911	2,194	$19,670
1890			1912	4,129	17,074
1891			1913	8,645	35,968
1892			1914	12,840	80,350
1893	50	2,000	1915	12,400	62,000
1894	51	2,040	1916	15,322	80,649
1895			1917	24,301	127,510
1896			1918	35,963	189,459
1897	5	200	1919	40,200	217,800
1898			1920	60,764	1,056,260
1899			1921	*90,739	1,016,675
1900			1922		
1901			1923		
1902	422	2,532	1924	*193,064	5,729,736
1903	2,703	16,015	1925		
1904	6,950	112,282	1926		
1905	3,000	15,000	1927	* 275,403	1,995,923
1906	2,430	14,400	1928		
1907	2,531	28,948	1929	*	*
1908	2,950	32,012	1930		
1909	500	3,500			
1910	1,843	17,617	Totals	799,438	$10,876,955

* Annual details concealed under 'Unapportioned.'

DOLOMITE

Bibliography: State Mineralogist Reports XV, XVII, XXVII

The 1930 production of dolomite in California came from a single quarry each in Inyo and Monterey counties. The annual details are concealed under the 'Unapportioned' item to conceal the output of either operator, and showed a decrease in both quantity and value from the 1929 production which was 58,644 tons, valued at $156,928. The material shipped was utilized for steel furnace flux and refractories, plaster, stucco dash-coat, and for manufacture of CO_2.

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Dolomite Production of California, by Years.

Previous to the 1915 statistical report of the State Mining Bureau, dolomite was included under limestone, as the two minerals are closely related chemically; but since dolomite, as such, has been found to have certain distinctive applications, we here give it a separate classification.

Amount and value of the output of dolomite, annually, have been as follows:

Year	Tons	Value
1915	4,192	$14,504
1916	13,313	46,566
1917	27,911	66,416
1918	24,560	79,441
1919	24,502	67,953
1920	42,388	132,791
1921	31,195	99,155
1922	52,409	114,911
1923	69,519	142,615
1924	28,843	71,271
1925	42,852	104,900
1926	68,640	119,313
1927	45,976	79,444
1928	38 379	85,34-
1929	58,644	156,92-
1930	*	*
Totals	573,323	$1,381,548

* Annual details concealed under 'Unapportioned'.

FELDSPAR

Bibliography: State Mineralogist Reports XV, XVII-XXVII (inc.). Bulletins 67, 91. U. S. Bureau of Mines, Bulletin 92. Eng. & Min. Jour.-Press, Vol. 115, pp. 535-538, Mar. 24, 1923.

Feldspar was produced by five operators in three counties (Kern, Riverside, and San Diego) in California during 1930 to the amount of 5014 short tons, valued at $35,654. This was a decrease in both quantity and value as compared with the 1929 figures which were 13,327 tons and $78,404.

The requirements of the pottery trade demand that in general the percentage of free silica associated with the feldspar be less than 20 per cent, and in some cases the potters specify less than 5 per cent. An important factor, also, is the iron-bearing minerals frequently present in pegmatites and granites, such as biotite (black mica), garnet, hornblende and black tourmaline. Feldspar for pottery uses should be practically free of these. The white, potash-mica, muscovite, is not particularly objectionable except that being in thin, flexible plates, it does not readily grind to a fineness required for the feldspar.

Total Feldspar Production of California.

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:

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Total Feldspar Production in California

Year	Tons	Value	Year	Tons	Value
1910	760	$5,720	1922	4,587	$37,109
1911	740	4,560	1923	11,100	81,800
1912	1,382	6,180	1924	9,055	68,112
1913	2,129	7,850	1925	8,165	59,615
1914	3,530	16,565	1926	7,300	56,400
1915	1,800	9,000	1927	10,932	86,101
1916	2,630	14,350	1928	14,628	93,745
1917	11,792	46,411	1929	13,327	78,404
1918	4,132	22,061	1930	5,014	35,654
1919	1,272	12,965			
1920	4,518	26,189	Totals	124,142	$797,129
1921	4,349	28,343			

FLUORSPAR

Bibliography: State Mineralogist Reports XVII, XVIII, XXIV, XXVI. Bulletins 67, 91. Eng. & Min. Jour.-Press, Vol. 177, pp. 489–492, Mar. 22, 1924.

Fluorspar, or calcium fluoride, CaF_2, is one of the most important nonmetallic minerals from an industrial standpoint. About 80 per cent of the commercial mineral is prepared in the 'gravel' form and utilized as a flux in the manufacture of steel, for which use no substitute has yet been found. In the United States, under normal business conditions, the consumption for that purpose is 125,000 to 150,000 tons annually. Fluorspar is also used in aluminum smelting, and in the manufacture of enameled ware, glazed tile and brick, opalescent glass and certain chemicals, particularly hydrofluoric acid and its derivatives. The mineral is marketed in three forms: lump, gravel, and ground.

According to the U. S. Bureau of Foreign and Domestic Commerce, imports of fluorspar into the United States in 1930 amounted to 57,949 long tons, valued at $544,656, and came principally from England, with smaller amounts from British South Africa, Italy, China and Netherlands. The 1930 figures were an increase from the previous year when 48,522 short tons worth $480,975 were imported.

In California deposits have been reported in Los Angeles, Mono, Riverside and San Bernardino counties, but no commercial production has resulted except in 1917–1918, when a total of 79 tons valued at $991 was shipped from Riverside County.

The Tariff Act of June 21, 1930, places a duty of $5.60 per ton on foreign importations of fluorspar.

Present quotations (Engineering and Mining Journal, New York) are not less than 85 per cent CaF_2 and not over 5 per cent SiO_2, $13; foundry lump, $15.

FULLER'S EARTH

Bibliography: State Mineralogist Reports XIV, XVII, XVIII, XXI, XXIII, XXV, XXVI. Bulletins 38, 91. U. S. Bureau of Mines, Bulletin 71. Eng. & Min. Jour.-Press, Vol. 121, pp. 837–842, May 22, 1926.

Fuller's earth includes many kinds of unctuous clays. It is usually soft, friable, earthy, nonplastic, white and gray to dark green in color,

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and some varieties disintegrate in water. In California, fuller's earth has been used in clarifying both refined mineral and vegetable oils, and for special chemical purposes; although its original use was in fulling wool, as the name indicates. Production has come mainly from Calaveras and Solano counties, with other deposits noted also in Riverside, Fresno, Inyo and Kern counties.

Clays of the montmorillonite and halloysite group ('rock soap') are being utilized by some of the oil refineries in lieu of true fuller's earth in the refining of petroleum products.

A production of 12,522 short tons, valued at $177,964 here credited to California for 1930 as 'fuller's earth' is in reality colloidal clay of the montmorillonite class (sold under such local names as 'bentonite,' 'otaylite,' 'shoshonite,' derived from the locality where found). Because of its being utilized for clarifying, filtering, and cleanser purposes, most of it in petroleum refining, we have placed it, for the purpose of the State Division of Mines statistical reports under the fuller's earth heading.

After all, the practical test of a fuller's earth is not so much chemical, as a physical one; that is, its physical capacity to absorb basic colors and to remove these colors from solution in animal, vegetable, or mineral oils, also from water.

The material above noted came from two properties each in San Bernardino and San Diego counties, and one in Kern County. The 1930 output showed a decreased tonnage and an increased value as compared with the 1929 figures which were 15,541 tons and $170,563.

The Tariff Act of June 21, 1930, placed a duty of $1.50 a ton on foreign produced imported fuller's earth.

Fuller's Earth Production of California, by Years.

Fuller's earth was first produced commercially in this state in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899	620	$12,400	1916	110	$550
1900	500	3,750	1917	220	2,180
1901	1,000	19,500	1918	37	333
1902	987	19,246	1919	385	3,810
1903	250	4,750	1920	600	6,000
1904	500	9,500	1921	1,185	8,295
1905	1,344	38,000	1922	6,606	48,756
1906	440	10,500	1923	3,650	55,125
1907	100	1,000	1924	5,290	67,295
1908	50	1,000	1925	5,280	91,842
1909	459	7,385	1926	23.552	250,192
1910	340	3,820	1927	13,018	154,764
1911	466	5,294	1928	53 323	501,743
1912	876	6,500	1929	15,541	170,563
1913	460	3,700	1930	12,522	177,964
1914	760	5,928			
1915	692	4,002	Totals	133,171	$1,031,598

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GEMS

Bibliography: State Mineralogist Reports II, XIV, XV, XVII, XVIII, XX, XXI–XXVI (inc.). Bulletins 37, 67, 91. U. S. G. S., 'Mineral Resources of the U. S.'; Bull. 603, p. 208. Bull. Dept. Geol. Univ. of Cal., Vol. 5, pp. 149–153, 331–380. Am. Jour. Sci., Vol. 31, p. 31.

The production of gem materials in California has been somewhat irregular and uncertain since 1911. The compilation of complete statistics is difficult owing to widely-scattered places at which stones are gathered and marketed for the most part in a small way. The gem material reported in California during 1930 had a total value of $3,540 in rough. The 1930 value showed a decrease from that of 1929 which was $26,850. Most of the above material was quartz crystals used for optical purposes or for radio, but included also blue agate, bloodstone and rose quartz which was shipped to China for cutting and polishing.

The following table shows the distribution of rough, uncut gems and jewelry materials during 1930:

County	*Variety*
Butte	Diamond
Calaveras	Quartz crystals
Inyo	Cyanite and chiastolite
Kern	Rose quartz
San Bernardino	Blue agate, bloodstone and Iceland spar
San Diego	Kunzite and tourmaline
Siskiyou	Agate
Tulare	Chrysoprase

Varieties of California's Gem Stones.

Diamonds have been found in a number of localities in California; but in every case, they have been obtained in stream gravels while working them for gold. The principal districts have been: Volcano in Amador County; Placerville, Smith's Flat and others in El Dorado County; French Corral, Nevada County; Cherokee Flat, Morris Ravine, and Yankee Hill, Butte County; Gopher Hill and upper Spanish Creek, Plumas County. The most productive district of recent years has been Cherokee in Butte County.

California *tourmalines* are decidedly distinctive in coloring and 'fire' as compared to foreign stones of this classification. The colors range from deep ruby to pink, and various shades of green, also blue.

One of our California gem stones, *benitoite,* has not been found elsewhere; and in but a single locality here: The Dallas Mine in San Benito County.

Kunzite, a gem variety of spodumene, was first found in the Pala district in San Diego County. It has thus far been found in only one locality (Madagascar) outside of California. It is of a lilac color, and is described in detail in Bulletin 37 of the State Mining Bureau.

Beryls of excellent fire and delicate colors are also obtained in the Pala district, of which the *aquamarine* (blue) and *morganite* (pink) varieties deserve special mention. Morganite, like kunzite, has thus far been found elsewhere only in Madagascar.

Californite, or 'California jade,' is a gem variety of *vesuvianite,* and is green or white in color. It is found in Butte, Fresno, and Siskiyou counties.

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Stones of precious blue *topaz* of fine quality are being cut from crystals mined in northern San Diego County. They are associated with beryl and blue tourmaline.

Some *rhodonite* has been mined in Siskiyou County, and used for decorative purposes, its value being included in the marble figures.

Garnets are found in a number of localities in California; the important yield of gems being *hyacinth* and *spessartite* varieties from San Diego County.

Chrysoprase has been produced in Tulare County.

Turquoise has been found in the desert section of San Bernardino County, but none produced commercially in recent years.

Sapphires have been reported found in San Bernardino and Riverside counties, but not as yet confirmed. A few have been found in stream gravels with diamonds in Butte County.

Rubies have been identified by the laboratory of the State Mining Bureau, occurring in limestone from the Baldy Mountains, San Bernardino County. Thus far no stones of commercial size have been taken out.

Total Production of Gem Materials in California.

The value of the gem output in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900	$20,500	1916	$4,75
1901	40,000	1917	3,04
1902	162,100	1918	65
1903	110,500	1919	5,42
1904	136,000	1920	36,05
1905	148,500	1921	10,95
1906	497,090	1922	1,31
1907	232,642	1923	13,22
1908	208,950	1924	4,80
1909	193,700	1925	10,66
1910	237,475	1926	9,04
1911	51,824	1927	7,03
1912	23,050	1928	22,20
1913	13,740	1929	26,85
1914	3,970	1930	3,54
1915	3,565	Total	$2,243,161

GRAPHITE

Bibliography: State Mineralogist Reports XIII, XIV, XV, XVII, XXVI (inc.). Bulletins 67, 91. U. S. G. S., Min. Res., 1914, Pt. II.

Graphite (also called plumbago) has been produced from time to time in the state, coming principally from Sonoma and Los Angeles counties. It is difficult for these deposits, which must be concentrated, to compete with foreign supplies, which go on the market almost directly as they come from the deposit. Graphite ores are concentrated with considerable difficulty, and the electric process of manufacturing artificial

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graphite from coal has been perfected to such a degree that only deposits of natural graphite of a superior quality can be exploited with any certainty of success.

According to the U. S. Geological Survey, operators in this country who are working disseminated flake deposits must depend on their No. 1 and No. 2 flake for their profit. Graphite dust is merely a by-product and is salable only at a low price.

The principal value of graphite is on account of its infusibility and resistance to the action of molten metals. It is also largely used in the manufacture of electrical appliances, of 'lead' pencils, as a lubricant, as stove polish, paints, and in many other ways. Amorphous graphite, commonly carrying many impurities, brings a much lower price. For some purposes, such as foundry facings, etc., the low-grade material is satisfactory. Among the interesting uses for graphite is the prevention of formation of scale in boilers. The action is a mechanical one. Being soft and slippery, the graphite prevents the particles of scale from adhering to one another or to the boiler and they are thus easily removed.

The price increases with the grade of material, the best quality crystalline variety being quoted at present (f.o.b. New York) at 6½–7½¢ per pound (Ceylon lumps).

The coarser flakes are necessary for crucibles, as they help to bind the clay together, in addition to their refractory service. Imports in 1930 from Ceylon, Canada, Madagascar, Mexico and Korea totaled 16,726 short tons, valued at $624,186, compared with 17,843 tons valued at $1,065,186 in 1929.

The Tariff Act of June 21, 1930, placed a duty on graphite or plumbago, crude or refined; Amorphous, 10% ad valorem; crystalline lump, chip or dust, 30% ad valorem; crystalline flake 1 65/100 cents per lb.

Occurrence of graphite has been reported at various times from Calaveras, Fresno, Imperial, Inyo, Los Angeles, Mendocino, San Bernardino, San Diego, Siskiyou, Sonoma and Tuolumne counties. There was no production, however, in 1928–1930 (inc.).

Graphite Production of California, by Years.

According to the records of the State Mining Bureau, the graphite production of California, by years, has been as follows:

Year	*Pounds*	*Value*
1901	128,000	$4,480
1902	84,000	1,680
1903		
1913	2,500	25
1914		
1915		
1916	29,190	2,335
1917		
1918	*770,000	37,225
1919		
1920		
1921	*624,000	26,160
1922		
1923		
1925		
1926	*76,000	13,120
1927		
1928		
Totals	2,113,690	$85,025

* Annual details concealed under 'Unapportioned,' on account of a single producer.

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GYPSUM

Bibliography: State Mineralogist Reports XIV, XV, XVII, XVIII, XXII, XXIII, XXV, XXVI. Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 223, 413, 430, 697. U. S. Bur. of Standards, Circular No. 281.

During 1930 there were shipments of gypsum in California, amounting to 116,865 short tons valued at $243,507, coming from two properties each in Fresno and Riverside counties and one each in Imperial and Kern counties. This was a decrease in both quantity and value compared with the 1929 output, which was 140,844 tons and $396,951.

Uses.

The most important use of gypsum from the quantity standpoint is in the calcined form where it is utilized in the manufacture of various hard-wall plasters and plaster board. As plaster of paris, it plays a very important part in surgical work. Approximately 2%, by weight, raw gypsum is added in the manufacture of Portland cement just before the final grinding. In this application, the gypsum acts as a retarder to the set of the cement. The use of gypsum tile for non-bearing fireproof partitions, stairway and elevator enclosures, and the protection of steel columns, girders and beams, has increased greatly.

Keene's cement is a gypsum product, calcined to complete dehydration, and an accelerator added such as alum, potassium sulphate, borax, aluminum sulphate.

Land plaster may be applied to the soil by drilling, or scattered in the hill, or it may be sowed broadcast, in quantities ranging from 200 to 500 pounds to the acre.

Total Production of Gypsum in California.

Production of gypsum annually in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887	2,700	$27,000	1910	45,294	$129,152
1888	2,500	25,000	1911	31,457	101,475
1889	3,000	30,000	1912	37,529	117,388
1890	3,000	30,000	1913	47,100	135,050
1891	2,000	20,000	1914	29,734	78,375
1892	2,000	20,000	1915	20,200	48,953
1893	1,620	14,280	1916	33,384	59,533
1894	2,446	24,584	1917	30,825	56,840
1895	5,158	51,014	1918	19,695	37,176
1896	1,310	12,580	1919	19,813	50,579
1897	2,200	19,250	1920	20,507	92,535
1898	3,100	23,600	1921	37,412	78,875
1899	3,663	14,950	1922	47,084	188,336
1900	2,522	10,088	1923	86,410	289,136
1901	3,875	38,750	1924	25,569	53,210
1902	10,200	53,500	1925	107,613	172,444
1903	6,914	46,441	1926	114,868	211,337
1904	8,350	56,592	1927	94,630	202,090
1905	12,859	54,500	1928	104,790	200,567
1906	21,000	69,000	1929	140,844	396,951
1907	8,900	57,700	1930	116,865	243,507
1908	34,600	155,400			
1909	30,700	138,176	Totals	1,386,231	$4,025,914

LIMESTONE

Bibliography: State Mineralogist Reports IV, XII–XV (inc.), XVII–XXVI (inc.). Bulletins 38, 91. Oregon Agr. College

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Extension Bulletin 305. Eng. and Min. Jour.-Press, Vol. 120, pp. 249–253.

'Industrial' limestone was produced by 16 operators in 9 counties in California during 1930 to the amount of 169,477 short tons valued at $508,751. Although there was a slight increase in the amount, the total value was less than that of 1929 figures, which were 168,315 tons and $557,617.

The amount here given does not include the limestone used in the manufacture of cement nor for macadam and concrete, nor of lime for building purposes; but accounts for that utilized as a smelter and foundry flux, for glass and sugar making, and other special chemical and manufacturing processes. It also includes that utilized for fertilizers (agricultural 'lime'), 'roofing gravel,' paint and concrete filler, whiting for paint, putty, kalsomine, terrazzo, paving dust, chicken grit, carbon dioxide gas, 'paving compound,' facing dust for concrete pipe, also for rubber and magnesite mix. The material from Ventura County was a marl and that from San Mateo and Santa Clara counties was shells dredged from San Francisco Bay, all of which was ground and used for agricultural purposes and poultry grit. Of the total 'industrial' limestone produced in 1930, approximately 29,823 tons valued at $134,618 were used for agricultural purposes.

Distribution of 1930 output of limestone was as follows:

County	*Tons*	*Value*
El Dorado	88,869	$205,225
Santa Cruz	11,405	46,925
Mendocino, San Bernardino, San Mateo, Santa Clara, Tulare, Tuolumne, Ventura*	69,203	256,601
Totals	169,477	$508,751

* Combined to conceal the output of operators in each.

Limestone Production of California, by Years.

The following tabulation gives the amounts and value of 'industrial' limestone produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. These tonnages consist principally of limestone utilized for flux, glass and sugar making, agricultural, chemical, and other special industrial purposes. That utilized in cement manufacture is not included:

Year	Tons	Value	Year	Tons	Value
1894	15,420	$19,275	1913	301,918	$274,455
1895	71,355	71,690	1914	572,272	517,713
1896	68,184	71,112	1915	146,324	156,288
1897	36,796	38,556	1916	187,521	217,733
1898	27,686	24,548	1917	237,279	356,396
1899	30,769	29,185	1918	208,566	456,258
1900	32,791	31,532	1919	88,291	248,145
1901	76,937	99,445	1920	90,120	298,197
1902	71,422	90,524	1921	75,921	305,912
1903	125,919	163,988	1922	84,382	282,181
1904	40,207	87,207	1923	143,266	348,464
1905	192,749	323,325	1924	219,476	582,660
1906	80,262	162,827	1925	319,977	494,525
1907	230,985	406,041	1926	108,795	367,501
1908	273,890	297,264	1927	699 790	663,957
1909	337,676	419,921	1928	127,895	397,935
1910	684,635	581,208	1929	168,315	557,617
1911	516,398	452,790	1930	169,477	508,751
1912	613,375	570,248			
			Totals	7,477,041	$10,975,374

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LITHIA

Bibliography: State Mineralogist Reports II, IV, XIV, XXI. Bulletins 38, 67, 91.

Lithia mica, lepidolite (a silicate of lithium and others) utilized in the manufacture of artificial mineral water, fireworks, glass, etc., has been mined in San Diego County since 1899, except between 1905 and 1915, though there was none shipped in 1923, 1925, 1929, and 1930. During 1930 there was a small amount of lepidolite mined in California, but none shipped. Some amblygonite, a lithium phosphate, is occasionally also obtained from pockets associated with the gem tourmalines.

Lithia mica total production in the state has been as follows:

Year	Tons	Value	Year	Tons	Value
1899	124	$4,600	1920	10,046	$153,502
1900	440	11,000	1921	*1,365	20,781
1901	1,100	27,500	1922		
1902	822	31,880	1923		
1903	700	27,300	1924	109	2,269
1904	641	25,000	1925		
1905	25	276	1926		
1906			1927	*550	13,900
1915	91	1,365	1928		
1916	71	1,065	1929		
1917	880	8,800			
1918	4,111	73,998	Totals	21,875	$417,636
1919	800	14,400			

* Annual details concealed under 'Unapportioned.'

MICA

Bibliography: State Mineralogist Reports II, IV. Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 740; Min. Res. of U. S. Eng. & Min. Jour.-Press, Vol. 115, pp. 55–60, Jan. 13, 1923.

Sericite, a fine-grained variety of muscovite, was shipped from Imperial County during 1929. This is the first commercial production of this material in California. This type of material is used as a cheap grade of ground mica for roofing, as a refractory, foundry facing, and decorative material to imitate snow.

Production of mica in California has been as follows:

Year	*Tons*	*Value*
1902	50	$2,500
1903	50	3,800
1904	50	3,000
1929	*	*
1930		
Totals	150	$9,300

* Annual details concealed under 'Unapportioned.'

Classification and Uses.

Practically all marketable mica is of the muscovite or phlogopite varieties. There are three main commercial classes: Sheet mica, including punch; splittings, and scrap. Sheet mica is used chiefly for electrical purposes and for glazing; splittings are made into built-up mica; scrap is ground to a powder. Mica to be classified as sheet must yield a rectangle of at least $1\frac{1}{2} \times 2$ in., must split evenly and freely, be free from cracks, rulings, or plications, and reasonably free from inclusions of foreign matter, though stains of a nonconducting char-

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acter are permissible for some uses. Ability to withstand heat and high electrical resistance have led to a wide application of sheet mica in the electrical industries. The electrical uses of sheet mica greatly exceed all others in quantity and value of the material used.

As a heat-resisting transparent medium, sheet mica has various uses. It is widely employed for stove windows, though this use has declined to a considerable extent. A hard and rigid mica that is nearly clear is best suited for stove fronts. High-grade stove mica commands a higher price than electrical mica, because for the most part larger sizes are demanded. Mica is also used in furnace and bake-oven sight-holes, heat screens, lamp chimneys, canopies and shades, particularly for gas mantels, and also for military lanterns and in lantern slides.

Its ability to withstand shocks and strains, combined with its transparency, has led to wide use in motor goggles, spectacles, drivers' helmets, smoke helmets, compass cards, gage fronts, and in windows subject to shock, as in the conning towers of warships. On account of its heat-resisting qualities, ground mica is used in railroad car axle packings, in pipe and boiler coverings, in fireproof paints, and in rubber tires. Ground mica is used as a component in roofing, as a filler in rubber and other products, in calico printing, and as a tire powder. It is used also in tinsel decorations, and as 'Santa Claus snow' for Christmas tree and window decorations. It is used as a lubricant for wooden bearings, and mixed with oil for metal bearings.

MINERAL PAINT

Bibliography: State Mineralogist Reports XII–XIX (inc.), XXI, XXII–XXVI (inc.). Bulletins 38, 91.

Mineral paint material was produced in California during 1930 by a single operator in Placer County. The details are under 'Unapportioned' to conceal his output. This was a decrease in both quantity and value from the 1929 output, which was 467 short tons, worth $2,820.

There has been a steady production of mineral paint in California since 1890, when the first recorded production was made. This material came from Alameda, Amador, Butte, Calaveras, Colusa, Los Angeles, Napa, Nevada, Placer, Riverside, Shasta, Sonoma, Stanislaus and Ventura counties. There are also other deposits that may have possible commercial value, but as yet there have been no commercial shipments from El Dorado, Imperial, Kern, Kings, Lake, Mendocino, San Diego, Siskiyou, Trinity and Yuba counties, in which they are found.

California mineral paints have been used as the color pigments in mortar, stucco, and cement mixes in kalsomine, pigments in oil paint, various fillers, in lineoleum, in cosmetics, etc. Their colors vary greatly, as also their composition; yellow, the most common, is colored by limonite; red is colored from hematite; the browns might be colored with either or both hematite or limonite, all of which are mixed with more or less clay. There are several plants in the state that treat their ochers, and blend them to give uniform colors and quality at all times. The color of the materials as they come from the mine will vary, but when properly handled a uniform quality and color can be maintained.

These deposits are found either as soft fine-grained red shales, as gossan after sulphide ore bodies, as yellow or brown clays colored by

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water carrying iron in solution and depositing it on the clay or from spring waters high in iron which deposit an iron oxide or hydroxide.

Besides the natural deposits, tailings from chlorination plants, pyrite sinter from acid works and magnetite concentrated from black sand have been used in the manufacture of synthetic ochers.

Mineral Paint Production of California, by Years.

The first recorded production of mineral paint materials in the state was in the year 1890. The output, showing annual amount and value since that time, is given herewith:

Year	Tons	Value	Year	Tons	Value
1890	40	$480	1911	186	$1,184
1891	22	880	1912	300	1,800
1892	25	750	1913	303	1,780
1893	590	26,795	1914	132	847
1894	610	14,140	1915	311	1,756
1895	750	8,425	1916	643	3,960
1896	395	5,540	1917	520	2,700
1897	578	8,165	1918	728	4,738
1898	653	9,698	1919	1,780	17,055
1899	1,704	20,294	1920	779	8,477
1900	529	3,993	1921	446	4,748
1901	325	875	1922	1,620	13,277
1902	589	1,533	1923	1,049	11,773
1903	2,370	3,720	1924	532	5,234
1904	270	1,985	1925	669	6,969
1905	754	4,025	1926	569	5,846
1906	250	1,720	1927	*	
1907	250	1,720	1928	919	9,592
1908	335	2,250	1929	467	2,820
1909	305	2,325	1930	*	*
1910	200	2,040	Totals	22,897	$219,098

*Annual details concealed under 'Unapportioned.'

MINERAL WATER

Bibliography: State Mineralogist Reports VI, XII–XVIII (inc.), XXI–XXVI (inc.). U. S. G. S., Water Supply Paper 338. Min. Res, 1914, 1916. 'Mineral Springs and Health Resorts of California,' by Dr. Winslow Anderson, 1890. U. S. Dept. of Agr., Bur. of Chem., Bulletin 91.

A widespread production of mineral water is shown annually in California. These figures refer to mineral water actually bottled for sale, or for local consumption. Water from some of the springs having a special medicinal value brings a price many times higher than the average shown, while in some cases the water is used merely for drinking purposes and sells for a nominal figure. Health and pleasure resorts are located at many of the springs. The waters of some of the hot springs are not suitable for drinking, but are very efficacious for bathing.

From a therapeutic standpoint, California is particularly rich in mineral springs. The counterparts of many of the world-famed spas of Europe and the eastern United States can be found here. Radioactivity has been noted in at least three localities in California: At The Geysers in Sonoma County, Arrowhead Hot Springs in San Bernardino County, and Paraiso Springs, Monterey County. It doubtless exists at others, but the State Division of Mines has not as yet had funds available to conduct the necessary investigations along this line.

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So far as the efficacy of radioactivity in mineral water is concerned, it has been found by investigations of the U. S. Geological Survey and the U. S. Department of Agriculture that it is not retained and transported in bottled water. Radioactivity in water is only temporary, and dissipates. To obtain whatever therapeutic effect it may possess, radioactive water should be utilized directly at the spring.

Commercial production of mineral water in California during 1930 amounted to 37,354,111 gallons, valued at $2,870,663, being the largest annual output ever recovered in this state. The previous record was reached in 1929 when the figures were 27,032,083 gallons and $2,040,615. The 1930 output was distributed by counties as follows:

County	*Gallons*	*Value*
Lake	36,758	$14,524
Los Angeles	23,695,673	2,152,928
Napa	43,902	13,837
Sonoma	17,900	5,318
Butte, Calaveras, Contra Costa, Fresno, Inyo, Marin, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Santa Clara, and Siskiyou*	13,559,878	684,056
Totals	37,354,111	$2,870,663

* Combined to conceal the output of a single operator in each.

The production above tabulated either came from springs or artesian wells, and was bottled, in part with artificial carbonation, but mostly natural, and sold for drinking purposes. A large part was used in the preparation of soft drinks with flavors.

Although some of the operators complain that prohibition has all but killed off the mineral water business, the reports of actual production of mineral water bottled and sold indicate an encouraging growth and a material increase annually both in total quantity and value, as may be noted from the tabulation below, with the exception of 1928, which shows a decreased value, although an increased quantity.

Mineral Water Production of California, by Years.

Mineral water was bottled for sale, at the Napa Soda Springs, Napa County, as early as 1860, and at other springs in California, notably The Geysers, Sonoma County, also at early dates; but there are no figures available earlier than the year 1887. Amounts and values, annually, since that year are shown herewith:

Year	Gallons	Value	Year	Gallons	Value
1887	618,162	$144,368	1910	2,335,259	$522,009
1888	1,112,202	252,990	1911	2,637,669	590,654
1889	808,625	252,241	1912	2,497,794	529,384
1890	258,722	89,786	1913	2,350,792	599,748
1891	334,553	139,959	1914	2,443,572	476,169
1892	331,875	162,019	1915	2,274,267	467,738
1893	383,179	90,667	1916	2,273,817	410,112
1894	402,275	184,481	1917	1,942,020	340,566
1895	701,397	291,500	1918	1,808,791	375,650
1896	808,843	337,434	1919	2,233,842	340,117
1897	1,508,192	345,863	1920	2,391,791	421,643
1898	1,429,809	213,817	1921	3,446,278	367,476
1899	1,338,537	406,691	1922	4,276,346	486,424
1900	2,456,115	268,607	1923	5,487,276	616,919
1901	1,555,328	559,057	1924	8,159,211	818,726
1902	1,701,142	612,477	1925	12,115,072	1,230,455
1903	2,056,340	558,201	1926	14,074,877	1,171,550
1904	2,430,320	496,946	1927	16,644,423	1,487,183
1905	2,194,150	538,700	1928	25,049,002	1,304,969
1906	1,585,690	478,186	1929	27,032,083	2,040,615
1907	2,924,269	544,016	1930	37,354,111	2,870,663
1908	2,789,715	560,507			
1909	2,449,834	465,488	Totals	211,007,567	$25,562,770

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PHOSPHATES

Bibliography: State Mineralogist Report XXI. Bulletins 67, 91.

No commercial production of phosphates has been recorded from California, though occasional pockets of the lithium phosphate, amblygonite, Li (AlF) PO_4, have been found associated with the gem tourmaline deposits in San Diego County. Such production has been classified under lithia.

PUMICE and VOLCANIC ASH

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII, XVIII, XXII–XXV (inc.). Bulletin 38. (See 'Tufa.')

The production of pumice and volcanic ash in California during the year 1930 amounted to 12,947 short tons, valued at $128,847, coming from two properties each in Fresno and Inyo counties and a single property each in Imperial, Kern, Mono, San Luis Obispo, and Siskiyou counties. The 1930 output showed a marked increase over that of 1929 which was 10,449 short tons, worth $76,123.

The material from Imperial, Inyo and Siskiyou is the viscular, block variety and was sold for abrasive purposes. The balance of the Mono material and that from Fresno, Kern and San Luis Obispo was the volcanic ash, or tuff variety, and was employed in making soap, cleanser compounds, and a large tonnage is being utilized as a concrete filler in cement displacement. The Kern county ash is going into the preparation of one of the popular and nationally advertised brands of cleanser compounds.

Pumice Production of California, by Years.

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not again until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909	50	$500	1921	406	$6,310
1910			1922	613	4,248
1911			1923	2,936	16,309
1912	100	2,500	1924	4,919	33,404
1913	3,590	4,500	1925	5,319	32,937
1914	50	1,000	1926	7,170	48,350
1915	380	6,400	1927	13,779	168,896
1916	1,246	18,092	1928	10,440	105,055
1917	525	5,295	1929	10,449	76,123
1918	2,114	28,669	1930	12,947	128,847
1919	2,388	43,657			
1920	1,537	25,890	Totals	80,958	$756,982

PYRITES

Bibliography: State Mineralogist Reports XVIII, XIX, XXII, XXV, XXVI, Bulletins 38, 91. Min. and Sci. Press, Vol. 144, pp. 825, 840.

A total production of 39,958 short tons of pyrite, valued at $194,228 was reported shipped in California during 1930 from properties in Alameda and Shasta counties. This was a decrease both in quantity and value from the 1929 figures which were 79,169 tons and $363,717.

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This material was mostly used in the manufacture of sulphuric acid for explosives and fertilizer. Some iron sulphate has been produced previously and was utilized directly in the preparation of an agricultural fertilizer and insecticide. The sulphur content ranged up to 50.8 per cent S.

This does not include the large quantities of pyrite, chalcopyrite, and other sulphides which are otherwise treated for their valuable metal contents. Some sulphuric acid is annually made as a by-product in the course of roasting certain tonnages of Mother Lode auriferous concentrates while under treatment for their precious metal values.

Pyrites Production in California, by Years.

The total recorded pyrites production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	$30,000	1915	92,462	$293,148
1899	5,400	28,620	1916	120,525	372,969
1900	3,642	21,133	1917	111,325	323,704
1901	4,578	18,429	1918	128,329	425,012
1902	17,525	60,306	1919	147,024	540,300
1903	24,311	94,000	1920	146,001	530,581
1904	15,043	62,992	1921	110,025	473,735
1905	15,503	63,958	1922	151,381	570,425
1906	46,689	145,895	1923	148,004	555,308
1907	82,270	251,774	1924	124,214	517,835
1908	107,081	610,335	1925	129,500	528,550
1909	457,867	1,389,802	1926	100,896	466,088
1910	42,621	179,862	1927	130,910	564,823
1911	54,225	182,954	1928	90,566	400,627
1912	69,872	203,470	1929	79,169	363,717
1913	79,000	218,537	1930	39,958	194,228
1914	79,267	230,058			
			Totals	2,960,183	$10,913,225

SHALE OIL

Bibliography: State Mineralogist Report XIX. U. S. Geol. Surv., Bulletins 322, 729. U. S. Bur. of Mines, Bull. 210. Eng. and Min. Jour.-Press, Vol. 118, No. 8, pp. 290–292, Aug. 23, 1924. Chem. & Met. Eng., Vol. 32, No. 6, Feb., 1925. Min. Congress Jour., Dec., 1924.

Oil shale is defined by Gavin,[1] as follows:

"Oil shale is a compact, laminated rock of sedimentary origin, yielding over 33 per cent of ash and containing organic matter that yields oil when distilled, but not appreciably when extracted with the ordinary solvents for petroleum."

* * * * * * *

"Oil shales contain a substance, or substances, usually classed as a pyro-bitumen, that by destructive distillation, or pyrolysis, yields oils somewhat similar to petroleum. These substances have been termed 'kerogen,' from two Greek words meaning producer of wax."

The Scottish oil shales are also known as 'torbanite.'

The so-called 'oil shales' of California do not for the most part conform to the above definition, as the greater part of the oil obtained from them occurs as such and can be extracted by suitable solvents. The most extensive deposits in this state are part of the Monterey formation of Tertiary age, and physically and chemically are different from the

[1] Gavin, M. J., Oil Shale, An Historical, Technical, and Economic Study: U. S. Bur. of Mines, Bull. 210, p. 26, 1924.

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oil shales of Scotland and from other oil shales in the United States. The mineral matter of this shale is diatomaceous; the beds that yield oil occur in massive formation; and when freshly broken smell strongly of petroleum. Most geologists consider the Monterey shales to have been the origin of the oil in some of the oil fields of California.

Although the extraction of shale oil has been a matter of commercial practice on a considerable scale for many years in Scotland, France and Australia, it has not attained any great commercial importance as yet in the United States. Technical knowledge of the subject, however, is increasing. With the gradual depletion of the underground reserves of liquid oil, it is merely a matter of time until the development of the oil shales of the United States will be an economic necessity. The selling price of petroleum will be the determining factor. The recovery of by-product ammonium sulphate is an important feature of the process.

Two plants on a more or less experimental scale have operated in California, with commercial production beginning in a small way in 1922. The product, in part, has been sold for utilization as a flotation oil in metallurgical work, and part has been consumed as fuel at the plants. There was no production reported for 1930.

Shale Oil Production of California, by Years

Year	*Barrels*	*Value*
1922–1923*	4,333	$44,262
1924–1925*	8,688	55,240
1926–1927*	8,819	9,998
1928	----	----
Totals	21,840	$109,500

* Annual details concealed under 'Unapportioned.'

SILICA (Sand and Quartz)

Bibliography: State Mineralogist Reports IX, XIV, XV, XVII, XVIII, XX–XXVII (inc.). Bulletins 38, 67, 91.

We combine these materials because of the overlapping roles of vein quartz which is mined for use in glass making and as an abrasive, and that of silica sand which, although mainly utilized in glass manufacture, also serves as an abrasive. Both varieties are also utilized to some extent in fire-brick manufacture.

A portion of the tonnage of vein quartz in California in 1916 and 1917 was employed in the preparation of ferro-silicon by the electric furnace. At present, some is utilized as a foundry flux, and for steel-casting molds. A portion of the silica sold (both sand and quartz) is also used in glazes for procelain, pottery and tile, and in the body of the ware to diminish shrinkage; and some of the sand for the preparation of sodium silicate ('water glass') and glass. Manufacturers of paint use finely-ground silica, which forms as much as one-third of the total pigment in some paints. For certain purposes finely-ground crystalline material is superior in paints to other materials because of the angularity of the grains, which makes them adhere more firmly to the article painted and after wear afford a good surface for repainting. The same angularity makes artifically comminuted crystalline quartz

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superior to natural sand for use in wood fillers. It is also preferable for soaps and polishing powders. Part of the 1925 output was used for roofing and stucco-dash granules.

We do not include under this heading such forms of silica as: quartzite, sandstone, flint, tripoli, diatomaceous earth, nor the gem forms of 'rock crystal,' amethyst, and opal. Each of these has various industrial uses, which are treated under their own designations.

The production of silica in California during 1930 amounted to 17,802 short tons, valued at $71,380, coming from eight properties in seven counties, viz: Contra Costa, El Dorado, Inyo, Monterey, Placer, Riverside, and San Diego. This was a decrease in both quantity and value from the 1929 output which was 18,686 tons worth $79,210. Of the above total 10,985 tons were glass sand and 6817 tons of vein and boulder quartz. In the past year, for making the higher grades of glass, a deposit in Contra Costa County is now replacing some of the sand imported from Belgium. Belgium sand has also displaced local material in the manufacturee of sodium silicate ('water glass'). There are various deposits of quartz in California which could be utilized for glass making, but to date they have not been so used owing to the cost of grinding and the difficulty of preventing contamination by iron while grinding.

Silica sand has been produced in the following counties of the state: Alameda, Amador, Contra Costa, El Dorado, Imperial, Los Angeles, Mariposa, Mono, Monterey, Orange, Placer, Riverside, San Diego, San Joaquin and Tulare, the chief centers being Contra Costa, Amador, Monterey and Los Angeles counties. The industry is of limited importance, so far, because of the fact that much of the available material is not of a grade which will produce first-class colorless glass; for such, it must be essentially iron-free. Even a fractional per cent of iron imparts a green color to the glass.

The Tariff Act of June 21, 1930, placed a duty on sand, containing 95 per cent or more of *Silica* and not more than six-tenths of 1 per cent of oxide of iron and suitable for use in the manufacture of glass, of $2 per ton.

Total Silica Production in California.

Total silica production in California since the inception of the industry, in 1899, is shown below, being mainly sand:

Year	Tons	Value	Year	Tons	Value
1899	3,000	$3,500	1916	20,880	$48,908
1900	2,200	2,200	1917	19,376	41,166
1901	5,000	16,250	1918	23,257	88,930
1902	4,500	12,225	1919	18,659	101,600
1903	7,725	7,525	1920	25,324	96,793
1904	10,004	12,276	1921	10,569	49,179
1905	9,257	8,121	1922	9,874	31,016
1906	9,750	13,375	1923	7,964	30,420
1907	11,065	8,178	1924	6,808	35,006
1908	9,255	22,045	1925	12,498	96,780
1909	12,259	25,517	1926	30,010	104,317
1910	19,224	18,265	1927	24,636	94,762
1911	8,620	8,672	1928	14,814	66,679
1912	13,075	15,404	1929	18,686	79,210
1913	18,618	21,899	1930	17,802	71,380
1914	28,538	22,688			
1915	28,904	34,322	Totals	462,151	$1,278,608

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SILLIMANITE–ANDALUSITE–CYANITE GROUP

Bibliography: State Mineralogist Reports XX, XXIII, XXIV XXVII. Bulletins 67, 91. Dana's Mineralogy. U. S. Geol Surv., Prof. Paper 110. U. S. Bureau of Mines, Inform. Circ 6255. Eng. & Min. Jour.-Press, Vol. 120, pp. 91–94, 1925. Amer Mineralogist, June, 1924.

Sillimanite and andalusite are both aluminum silicates (Al_2SiO_5), having the same composition and formula, but with slightly different physical characteristics. Though both crystallize in the orthorhombic system, their crystal habits are different, andalusite being usually in coarse prismatic forms, the prisms nearly square in shape; also occurs massive, imperfectly columnar, and sometimes radiated and granular. Sillimanite commonly occurs in long, slender crystals, not distinctly terminated; prismatic faces striated and rounded; often in close parallel groups, passing into fibrous and columnar massive forms, sometimes radiating. Colors are similar. Hardness, andalusite 7.5, sillimanite 6–7. Andalusite is slightly lighter in specific gravity.

A massive deposit of andalusite, found in Dry Creek Canyon in the White Mountains of the Inyo Range, in Mono County, is being mined by the Champion Porcelain Company of Detroit, Michigan. The material is shipped East and utilized in the manufacture of porcelain for automobile spark plugs, for other high-tension electric insulators, laboratory ware and porcelain. Porcelain made from these minerals can be subjected to sudden and extreme changes in temperature without damage.

Cyanite is also an aluminum silicate (Al_2SiO_5), of the same chemical composition as andalusite and sillimanite, but crystallizing in the triclinic system. Occurs usually in long-bladed crystals, rarely terminated; hardness 5-7.25; gravity 3.56-3.67 (being heavier than the other two); color, blue. A deposit of cyanite, apparently in quantity, is being developed in Imperial County, near Ogilby, and shipments made to a refractory plant in Los Angeles.

Dumortierite, though differing somewhat in composition from the above, being a basic aluminum silicate ($HAl_8BSi_3O_{20}$), has proved similar in behavior in ceramic work so that it is now being mixed with andalusite for electrical procelains. A deposit of this mineral in Nevada is being mined for that purpose. Occurrences of massive dumortierite are known in Imperial and San Diego counties in this state and there may yet be some commercial possibilities for them.

Total Sillimanite Group Production of California, by Years

Year	*Tons*	*Value*
1922 1923 1924 *	4,584	$98,790
1925 1926 *	4,810	203,000
1927 1928 *	4,276	76,000
1929 1930 *	4,359	198,893
Totals	18,029	$576,683

* Annual details concealed under 'Unapportioned.'

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SOAPSTONE and TALC

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII–XXVI (inc.). Bulletins 38, 67, 91. U. S. Bur. of Mines, Bulletin 213. Rep. of Investigations, Serial No. 2253, May, 1921.

The total output of talc and soapstone in California during 1930 amounted to 15,861 short tons valued at $154,258. This was a decrease in both quantity and value from the 1929 figures, which were 18,676 tons and $193,493. Over 75% of the product was high-grade talc from Inyo and San Bernardino counties, which material was utilized mainly in toilet powders, paint, paper and rubber manufacture, and some in ceramics. The remainder came from Butte, El Dorado and Los Angeles counties, being soapstone. El Dorado and Inyo counties had two producers each, and Butte, Los Angeles and San Bernardino counties a single producer each.

The 'soapstone' grades were used mainly for roofing granules and as a filler in roofing paper, and part also in magnesite cement.

It is reported that Californian talc is replacing imported talc in the toilet trade on the basis of quality. The largest production of talc in the United States comes from Vermont and New York, and of massive soapstone from Virginia.

Composition and Varieties.

Talc is hydrous magnesium silicate with the chemical formula $H_2Mg_3(SiO_3)_4$. It is also called soapstone and steatite. The term 'talc' properly includes all forms of the pure mineral, whereas 'steatite' denotes particularly the massive, compact variety, and 'soapstone' the impure, massive forms containing as low as 50% of talc. When pure, talc is soft, having a hardness of 1, but impurities increase the hardness up to 3 or 4. The color varies from pure white and silvery white through gray, green, apple green, to dark green, also yellow, brown, and reddish when impure. It is commonly compact or massive, or in fine granular aggregates, and often in foliated plates or in fibrous aggregates.

Uses.

Although the uses of talc and soapstone are many and varied, some of them are not in general well known nor fully developed; and although few of their uses can justly be considered essential in the sense that no substitute can be used, there are several which are of great importance. The widest use of talc is in the powdered form, and the value depends upon color (whiteness), uniformity, fineness of grain, freedom from grit, 'slip,' and sometimes freedom from lime. The white varieties, free from grit and iron, low in lime, ground to 200-mesh and finer, are largely used as a filler for paper, rubber and paint, and the very highest grade as toilet powder. Ground talc is also used in dressing and coating cloth, in making soap, rope, twine, pipe-covering compounds, heavy lubricants, and polishes, and as a filler in concrete to make it waterproof. Ground talc and soapstone are used for foundry facings, either alone or mixed with graphite and a coarser grade is used in the manufacture of asphalt-coated roofing felts and

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papers, both as a filler and as a surfacing. Massive close-grained talc free from iron and grit, is cut into blanks and baked, forming the material used for gas tips and electrical insulation, commonly known as 'lava.' Its hardness, its resistance to heat, acids and alkalies, and its great dielectric strength make it very useful for electric insulation and no satisfactory substitute for it has been found.

Massive varieties of talc, pyrophyllite, and high grades of soapstone are cut into slate pencils and steel-workers' crayons. 'French chalk' or 'tailor's chalk' is a soft, massive talc. In China, Japan and India massive talc (steatite) is carved into grotesque images and other forms and is often sold as imitation jade. Soapstone is cut into slabs of 1 and 2 inches in thickness and sold as griddles, footwarmers, and fireless-cooker stones, or fabricated into laundry sinks and tubs, laboratory-table tops, hoods, tanks and sinks, electric switchboards, and for other uses in which the properties of resistance to heat, acids and alkalies and electricity are essential.

Imports.

Foreign importations of high-grade white talc suitable for the manufacture of toilet powder have come mainly from Canada, Italy and France. Foreign producers have the benefit of cheap labor, and a low tariff import duty. In addition to these disadvantages, California operators have to contend with transcontinental freight rates to the eastern manufacuring centers. During 1930 importation totaled 25,212 short tons, valued at $509,074, as compared with 31,247 tons worth $671,310 during 1929, according to the United States Bureau of Foreign and Domestic Commerce.

The Tariff Act of 1930 places a duty on talc, steatite or soapstone and French chalk; crude or unground of one-fourth of one cent per pound.

Talc Production of California, by Years.

Production was intermittent in the state up to 1912; but there has been a material growth since 1916, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893	400	$17,750	1913	1,350	$6,15
1894			1914	1,000	4,50
1895	25	375	1915	1,663	14,73
1896			1916	1,703	9,88
1897			1917	5,267	45,27
1898			1918	11,780	85,53
1899			1919	8,764	115,09
1900			1920	11,327	221,36
1901	10	119	1921	8,752	130,07
1902	14	288	1922	13,378	197,18
1903	219	10,124	1923	17,439	252,61
1904	228	2,315	1924	16,179	242,77
1905	300	3,000	1925	15,465	239,08
1906			1926	17,004	255,64
1907			1927	16,218	164,74
1908	3	48	1928	18,668	251,37
1909	33	280	1929	18,676	193,49
1910	740	7,260	1930	15,861	154,25
1911					
1912	1,750	7,350	Totals	204,196	$2,632,69

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STRONTIUM

Bibliography: State Mineralogist Report XXVI. Bulletins 67, 91. U. S. G. S., Bull. 540; 660–I.

There has been no production of strontium minerals in California since 1918, though in that year both celestite ($SrSO_4$), and the carbonate, strontianite ($SrCO_3$) were shipped. The first recorded commercial output of strontium minerals in California was in 1916. The occurrence of the carbonate is particularly interesting and valuable, as it appears to be the only considerable deposit of commercial importance so far opened up in the United States. Shipments reported as averaging 80% $SrCO_3$ have been made. The deposit is associated with deposits of barite near Barstow, San Bernardino County. The carbonate has also been found in massive form near Shoshone, Inyo County. In addition to Imperial County, celestite is found near Calico and Ludlow, and in the Avawatz Mountains in San Bernardino County, but as yet undeveloped.

Production of strontium minerals in California, by years, has been as follows:

Year	Tons	Value
1916	57	$2,850
1917	3,050	37,000
1918	2,900	33,000
1919	----------	----------
Totals	6,007	$72,850

The principal use for strontium in the United States is in the form of the nitrate in the manufacture of red flares, or Costen and Bengal lights and fireworks. It is imported mainly from Germany and England. In Germany and Russia, strontium in the form of the hydroxide is used in the manufacture of beet sugar. It is stated that strontia is more efficient and satisfactory in that process than lime, as it gives an additional recovery of 6% to 8%.

Of the two minerals, strontianite (carbonate) and celestite (sulphate), the carbonate is the more desirable, as it is easier to convert to other salts; but it is scarcer. Celestite is found with limestone and sandstone and is sometimes associated with gypsum. Strontianite is also found with limestone, but associated with barite and calcite.

SULPHUR

Bibliography: State Mineralogist Reports IV, XIII, XIV, XXV. Bulletins 38, 67, 91.

During 1929 and 1930 there was a small production of sulphur rock in California. This material came from Colusa County and was utilized in the manufacture of a fertilizer and in dusting for mildew. The annual details are concealed in the 'Unapportioned' item to conceal the output of a single operator. This was the first commercial output of native sulphur for several years, the last previous production was in

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1923 and 1924 and came from Kern County. This mineral has been found to some extent in Colusa, Imperial, Inyo, Kern, Lake, Sonoma, Tehama, and Ventura counties.

The most important use of sulphur is in the making of sulphuric acid used in turn in manufacture of superphosphate fertilizers, chemicals, dyes and explosives; in steel pickling and galvanizing; refining of petroleum, in sugar industry, in storage battery and many other purposes. Other uses of sulphur are the making of sulphur dioxide (SO_2); in agriculture (fertilizer and insecticide); in the manufacture of rubber; and in the manufacture of carbon tetrachloride.

The principal sources in the United States are the stratified deposits in Louisiana and Texas, extraction being accomplished by a unique system of wells with steam pipes. It is stated that three large companies operating there are capable of producing more than 2,500,000 tons annually in excess of our normal consumption in the United States, which averages about 1,000,000 tons. The mines at Freeport, Texas, are in a peculiarly favorable location in that they are practically at tidewater.

Formerly considerable sulphur was imported from Italy and from Japan; but the situation is now reversed, so that in 1930 a total of 598,220 long tons valued at $12,525,718 was exported from the United States, principally to Europe and Canada, also Australia, New Zealand, Mexico and South America. The 1930 figures showed a decrease from those of 1929 which were 855,542 long tons and $17,648,949.

Total Production of Sulphur in California.

Sulphur was produced at the famous Sulphur Bank mine in Lake County, during the years 1865–1868 (inc.); following which the property became more valuable for its quicksilver. The Elgin quicksilver mine, near Wilbur Springs, Colusa County, is a similar occurrence.

Production of sulphur in California to date:

Year	*Tons*	*Value*
1865, 1866, 1867 *	941	$53,500
1868 to 1922	----	-------
1923, 1924 *	185	4,071
1925 to 1928	----	-------
1929, 1930	*	*
Totals	1,126	$57,571

* Annual details concealed under 'Unapportioned.'

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CHAPTER SIX

SALINES

Bibliography: State Mineralogist Reports III, XIV, XV, XVII–XXVI (inc.). Bulletin 24. Spurr and Wormser, "Marketing of Minerals." "Non-Metallic Minerals," by R. B. Ladoo. See also under each substance.

Under this heading are included borax, common salt, soda, potash, and other alkaline salts. The first two have been produced in a number of localities in California, more or less regularly since the early sixties. Except for a single year's absence, soda has had a continuous production since 1894. Potash, magnesium chloride and sulphate, and calcium chloride have been added to the commercial list in recent years, and in 1926 joined by bromine. The nitrates are still prospective.

Our main resources of salines are the lake beds of the desert regions of Imperial, Inyo, Kern, Los Angeles, San Bernardino, and San Luis Obispo counties, and the waters of the Pacific Ocean.

The total value of this group showed a decrease to $9,943,500 in 1930 from the 1929 figures which were $10,960,557 and the highest annual value on record for these materials. The following table gives details for the years 1929 and 1930:

Substance	1929		1930		Increase+ Decrease— Value
	Tons	Value	Tons	Value	
Borates	144,678	$3,312,085	209,869	$3,686,817	$374,733+
Salt	392,039	2,665,436	347,945	1,167,487	1,594,949—
Soda	90,646	1,838,657	90,122	1,627,344	211,313—
Unapportioned*		3,144,379		3,461,852	315,473+
Total value		$10,960,557		$9,943,500	
Net decrease					$1,017,057

* Includes bromine, calcium chloride, magnesium salts and potash.

BORATES

Bibliography: State Mineralogist Reports III, X, XII–XV (inc.), XVII–XXIII (inc.), XXV, XXVI. Bulletins 24, 67, 91.

During 1930 there was produced in California a total of 215,986 tons of borate materials, compared with 162,059 tons for the year 1929. The material shipped during the year included the new sodium borates, kernite (rasorite), kramerite and some colemanite from Kern County; also crystallized borax prepared by evaporation of brines at Searles Lake in San Bernardino County and Owens Lake in Inyo County.

As the crude ore is not sold as such, but is almost entirely calcined before shipping to the refinery for conversion into the borax of commerce, and because of the fact that the material varied widely in boric acid content, we have recalculated the tonnage to a basis of 40 per cent, A. B. A. This is approximately the average A. B. A. content of the

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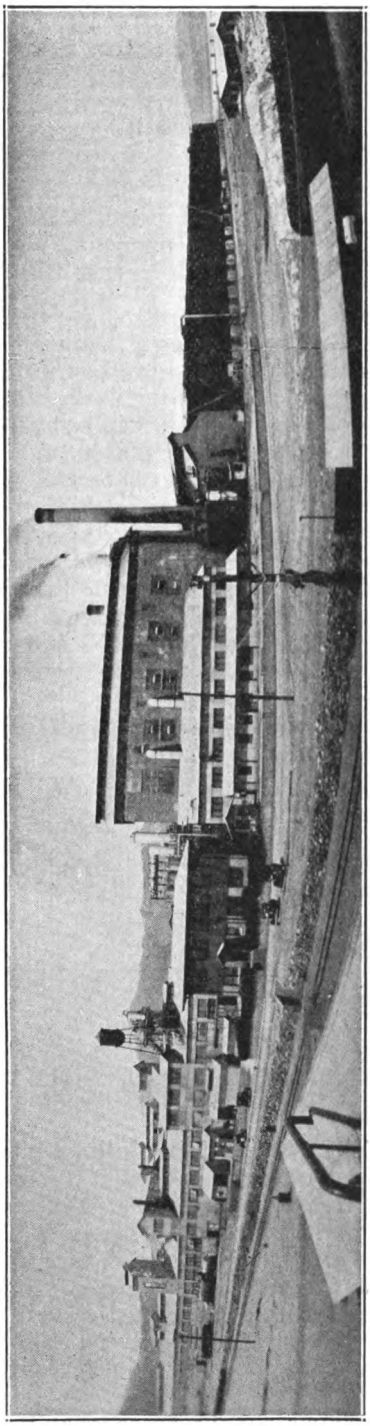

Plant of American Potash and Chemical Company, Trona, California —*Photo by W. B. Tucker*

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colemanite material after calcining, and also of the crystallized borax obtained from evaporation of the lake brines.

Recalculated as above, the 1930 production totaled 209,869 tons valued at $3,686,817, being an increase in both quantity and value over the 1929 output, which was 144,678 tons worth $3,312,085.

Colemanite is a calcium borate, and the material mined is shipped to seaboard chemical plants for refining. The latest development in the borax industry is the finding in quantity and opening up of a group of new borate minerals which have now supplanted colemanite in much the same way that colemanite deposits displaced the borax industry in the desert playas or dry lakes, some forty years ago. These new minerals are 'kernite' (or 'rasorite'), a sodium borate with a smaller water-of-crystallization content than the 'borax' of commerce, so that when recrystallized to borax, the resulting product has an increased weight over the original material, and kramerite, a hydrous sodium-calcium borate. These deposits are being mined by the Pacific Coast Borax Company, Suckow Borax Mines, Inc., and Western Borax Company, in southeastern Kern County.

Refined 'borax' (sodium tetraborate) is used in making the enameled coating for cast-iron and steelware employed in plumbing fixtures, chemical equipment, and kitchen utensils. It is also a constituent of borosilicate glasses which are utilized in making lamp chimneys, baking dishes, and laboratory glassware. Other important uses of borax are in the manufacture of laundry and kitchen soaps, in starch, paper sizing, tanning, welding, and in the preparation of boric acid, which is employed as an antiseptic and in preserving meats. Among the newer uses for borax is its employment in the preserving of citrus fruits by washing them in a solution of borax, which closes the pores of the skin. The application of this process is stated to be important in California and Florida. Another is as a preservative of wood, in addition to which borax, being noninflammable, renders it fireproof.

The total amount of borates exported from the United States[1] during the year 1930 was 82,931 short tons valued at $3,057,794 as compared with 79,884 tons worth $2,934,660 in 1929.

Total Production of Borate Materials in California.

Borax was first discovered in California in the waters of Tuscan Springs in Tehama County, January 8, 1856. Borax Lake in Lake County was discovered in September of the same year by Dr. John A. Veach. This deposit was worked in 1864–1868, inclusive, and during that time produced 1,181,365 pounds of refined borax. The bulk of it was exported by sea, to New York. This was the first commercial output of this salt in the United States, and California is still today the leading American producer of borax, having been for many years the sole producer.

Production from the dry lake 'playa' deposits of Inyo and San Bernardino counties began in 1873; but it was not until 1887 that the borax industry was revolutionized by the discovery of the colemanite beds at Calico, in San Bernardino County, and later similar beds in Inyo and Los Angeles counties. The colemanite deposits of Ventura

[1] Monthly Summary of Foreign Commerce of the United States, Department of Commerce, Dec., 1930, Part 1.

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County are at present unworked, owing to lack of transportation facilities. Some production of colemanite has been made from deposits opened up in Clarke County, Nevada.

The total production of borate materials in California is shown in the following table:

Total Production of Borate Materials in California

Year	Tons	Value	Year	Tons	Value
1864	12	$9,478	1898	8 300	$1,153,000
1865	126	94,099	1899	20,357	1,139,882
1866	201	132,538	1900	25,837	1,013,251
1867	220	156,137	1901	22,221	982,380
1868	32	22,384	1902	[1]17,202	2,234,994
1869			1903	34,430	661,400
1870			1904	45,647	698,810
1871			1905	46,334	1,019,158
1872	140	89,600	1906	58,173	1,182,410
1873	515	255,440	1907	53,413	1,200,913
1874	915	259,427	1908	22,200	1,117,000
1875	1,168	289,080	1909	16,628	1,163,960
1876	1,437	312,537	1910	16,828	1,177,960
1877	993	193,705	1911	50,945	1,456,672
1878	373	66,257	1912	42,135	1,122,713
1879	364	65,443	1913	58,051	1,491,530
1880	609	149,245	1914	62,500	1,483,500
1881	690	189,750	1915	67,004	1,663,521
1882	732	201,300	1916	103,523	2,409,375
1883	900	265,500	1917	109,944	2,561,958
1884	1,019	198,705	1918	88,772	1,867,908
1885	942	155,430	1919	66,791	1,717,192
1886	1,285	173,475	1920	127,065	2,794,206
1887	1,015	116,689	1921	50,136	1,096,326
1888	1,405	196,636	1922	[2]39,087	1,068,025
1889	965	145,473	1923	62,667	1,893,798
1890	3,201	480,152	1924	52,070	1,599,149
1891	4,267	640,000	1925	46,124	1,526,938
1892	5,525	838,787	1926	47,605	1,625,298
1893	3,955	593,292	1927	72,462	3,043,260
1894	5,770	807,807	1928	109,722	3,378,552
1895	5,959	595,900	1929	144,678	3,312,085
1896	6,754	675,400	1930	209,869	3,686,817
1897	8,000	1,080,000			
			Totals	2,058,209	$64,993,607

[1] Refined borax. [2] Recalculated to 40% 'anhydrous boric acid' equivalent beginning with 1922.

BROMINE

The first commercial production of bromine and bromine compounds was begun during 1926 by the California Chemical Corporation in its plant at Chula Vista, San Diego County, from salt works bittern waters. This same plant has been recovering magnesium chloride for a number of years. A small amount of bromine was also reported made at a similar bittern-water plant at Newark, Alameda County. The total commercial production of bromine in California for 1926 through 1928 amounted to 158 short tons, valued at $120,480, the 1929 and 1930 production and annual details for the first three years being concealed under the 'Unapportioned' item.

A large part of the bromine output of the United States is not sold as bromine, but in the form of potassium and sodium bromides and other salts. The principal production in the United States has come from bitterns from salt wells in Michigan, Ohio and West Virginia.

The best known uses of bromine are its application in the form of silver bromide in photography and the manufacture of ethyl gasoline. Production in California has increased rapidly the past two years on account of the last named. Bromine, as such, was used extensively in

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the European War in making asphyxiating gases. It also has some uses in medicine, particularly in the treatment of nervous diseases.

CALCIUM CHLORIDE

Bibliography: U. S. Geol. Surv., Min. Res. 1919, Pt. II. Engineering and Contracting, Roads and Streets, monthly issue, Feb. 6, 1924. 'How to Maintain Roads,' manual of instruction of Dow Chemical Company.

Calcium chloride is hygroscopic, that is, it has an affinity for water. This property is taken advantage of by utilizing this salt as a drying agent. It is also sprinkled on dirt roads and playgrounds to keep down dust by absorbing moisture. In refrigerating machinery for ice factories, meat-packing houses and cold-storage warehouses, a calcium-chloride solution is stated to have some advantages over salt brine. In fire buckets this solution has an advantage over pure water, in that it has a lower freezing point, does not corrode metal, and tends to keep the buckets full due to its absorbing moisture from the atmosphere. Powdered calcium chloride is used in drying gases, fruits and vegetables.

Total Calcium Chloride Production in California.

Commercial production of calcium chloride in California was first reported to the State Mining Bureau in 1921, from two plants in San Bernardino County, being obtained as a by-product in the refining of salt from deposits in certain of the desert dry lakes.

During 1930 the production of calcium chloride in California came from San Bernardino County from two plants. The annual details are concealed under the 'Unapportioned' item to conceal the output of either operator. Total production in California in shown in the following tabulation:

Year	Tons	Value
1921	683	$22,980
1922 *		
1923	1,204	26,580
1924 *		
1925	10,988	328,876
1926 *		
1927	34,195	508,748
1928 *		
1929	12,020	114,080
1930	*	*
Totals	59,090	$1,001,264

* Annual details concealed under 'Unapportioned.'

MAGNESIUM SALTS

Bibliography: State Mineralogist Reports XX, XXI, XXV, XXVI. Bulletin 91. 'Dictionary of Applied Chemistry,' by Thorpe. U. S. Geol. Surv., Min. Res. of P. S.

The 1930 production of magnesium salts in California is concealed under 'Unapportioned.' This was the chloride and the carbonate. The chloride was nearly all sold for use in magnesite stucco and cement

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mixtures (Sorel cement), also some for road liquor. The carbonate, a bulky white powder, was used as a heat-insulating material, as a filler for rubber, paper, paint, etc., and in medicines, in tooth paste, in face powder and as a polish for metal and glass. The sulphate marketed was utilized for medicinal and bath purposes. The material coming from San Diego County was residual bitterns from the salt plants and was in part marketed in the liquid form carrying from 35 per cent to 67 per cent $MgCl_2$ and in part as dry crystals, while that from San Mateo County was magnesium carbonate.

The use of magnesite cement and stucco in building construction on the Pacific Coast has created a market for magnesium chloride here; but the domestic article has to meet the competition of the cheaper, imported German chloride.

The average value reported for the chloride produced in California in 1930 was approximately $29 per ton, f.o.b. plant.

Total Production of Magnesium Salts in California.

Commercial production of magnesium chloride in California was begun in 1916 by some of the salt companies, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride. In addition, some magnesium sulphate, or 'epsom salts' is also made, annually, but in smaller amount, and magnesium carbonate by a patented process, direct from sea water.

The total production of magnesium salts in California, since the beginning of the industry here, is shown in the following tabulation:

Year	Tons	Value
1916	851	$6,407
1917	1,064	34,973
1918	1,008	29,955
1919	1,616	82,457
1920	3,150	107,787
1921	4,153	106,140
1922	3,036	89,788
1923	3,662	116,031
1924	4,823	145,883
1925	4,221	132,553
1926	4,881	124,470
1927* 1928*	6,241	139,589
1929* 1930*	4,914	333,906
Totals	43,620	$1,449,939

* Annual details concealed under 'Unapportioned.'

NITRATES

Bibliography: State Mineralogist Report XV, XXV, XXVI. Bulletins 24, 67, 91. U. S. G. S., Press Bulletin No. 373, July, 1918. Smithsonian Inst., Publ. No. 2421, 1916.

Nitrates of sodium, potassium and calcium have been found in various places in the desert regions of the state, but no deposit of commercial value has been developed as yet. It is hoped that a closer search may some day be rewarded by workable discoveries. At present the princi-

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pal commercial source of nitrates is the Chilean saltpeter (sodium nitrate) deposits in South America.

The fixation of atmospheric nitrogen electrically has been accomplished successfully in Germany and Scandinavia. The possibilities of cheap hydro-electric power in California make the subject one of interest to us, as we have also the natural raw materials and chemicals to go with the power. Sodium and potassium cyanides can be made by fixation of atmospheric nitrogen electrically.

POTASH

Bibliography: State Mineralogist Reports XV, XVIII, XX, XXII, XXV, XXVI. Bulletins 24, 67, 91. U. S. G. S., Min. Res. 1913, 1914, 1915. Senate Doc. No. 190, 62 Congress, 2d Session. Mining & Sci. Press Vol. 112, p. 155; Vol. 114, p. 789. Eng. & Min. Jour.-Press, Vol. 117, p. 557, Apr. 5, 1924.

The 1930 production of potash in California came from a single operator in San Bernardino County, the details of which are concealed under the 'Unapportioned' item. This was principally chloride and the product averaged 60% equivalent K_2O content. The material was sold mainly for fertilizer manufacture.

Imports of crude potash minerals and salts into the United States during 1930, according to the U. S. Bureau of Foreign and Domestic Commerce amounted to 833,879 long tons valued at $19,908,428, compared with 777,909 long tons worth $17,638,848 in 1929. These materials consisted mainly of 'manure salts,' crude chloride (muriate) and sulphate, and kainite, all of which are admitted duty-free.

Quotations have recently ranged from $46 per ton c.i.f. Atlantic and Gulf ports for high-grade sulphate (90%–95%), $35 per ton for muriate (80%–85%), and $19 for manure salts (30%).

Other uses for potash salts, besides those noted above, are in the manufacture of the best liquid soap and some higher-grade cake soaps, of some finer grades of glass, and in matches. The chemical requirements include tanning, dyeing, metallurgy, electroplating, photography and medicine.

Total Production of Potash in California.

Potash production began commercially in California in 1914, with a small yield from kelp. The bulk of the output comes from deposits of potash-bearing residues and brines in the old lake beds of the desert regions, particularly Searles Lake, San Bernardino County. A small amount has been made from salt-works bitterns, and for a time there was some from Portland cement dust. Some also has been obtained from molasses distillery-slops char.

The annual amounts and value of these potash materials, since their beginning in California in 1914, are shown by the following table:

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Total Production of Potash in California

Year	Tons	Value
1914	10	$460
1915	1,076	19,391
1916	17,908	663,605
1917	129,022	4,202,889
1918	49,381	6,808,976
1919	28,118	2,415,963
1920	26,298	1,465,463
1921	14,806	390,210
1922	17,776	584,388
1923	29,597	709,836
1924	33,107	747,407
1925	36,355	829,770
1926	32,884	812,285
1927	67,340	1,952,852
*1928	178,680	5,522,350
*1929		
1930	*	*
Totals	662,358	$27,131,845

* Annual details concealed under 'Unapportioned.'

SALT

Bibliography: State Mineralogist Reports II, XII–XV (inc.), XVII–XXIII (inc.), XXV, XXVI. Bulletins 24, 67, 91. U. S. Geol. Survey, Bull. 669. U. S. Bur. of Mines, Bull. 146.

Most of the salt production in California is obtained by evaporation of water of the Pacific Ocean, plants being located on the shores of San Francisco, Monterey, and San Diego bays, and at Long Beach. Additional amounts are derived from lakes and lake beds in the desert regions (in part, rock salt), mainly in Inyo, Kern and San Bernardino counties, and evaporation of alkaline lake water in Modoc County. A small amount of valuable medicinal salts has been obtained by evaporation of the water of Lake Mono, Mono County.

During 1930 in California there was an output of 347,945 short tons of salt valued at $1,167,487, being a decrease in both quantity and value from the 1929 figures, which were 392,039 short tons and $2,665,436. There were thirteen plants operating in 1930, three of which were in Alameda, two each in San Bernardino and San Mateo, and one each in Inyo, Kern, Los Angeles, Modoc, Monterey and San Diego.

The average value reported for salt produced in California in 1930 was $3.36 per ton f.o.b. plant, as compared with $6.80 in 1929 and $3.00 in 1928.

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Production of Salt in California, by Years.

Amount and value of annual production of salt in California from 1887 is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	28,000	$112,000	1910	174,920	$395,417
1888	30,800	92,400	1911	173,332	324,255
1889	21,000	63,000	1912	185,721	383,370
1890	8,729	57,085	1913	204,407	462,681
1891	20,094	90,303	1914	223,806	583,553
1892	23,570	104,788	1915	169,028	368,737
1893	50,500	213,000	1916	186,148	455,695
1894	49,131	140,087	1917	227,825	584,373
1895	53,031	150,576	1918	212,076	806,328
1896	64,743	153,244	1919	233,994	896,963
1897	67,851	157,520	1920	230,638	972,648
1898	93,421	170,855	1921	197,989	832,702
1899	82,654	149,588	1922	223,238	819,187
1900	89,338	204,754	1923	275,979	1,130,670
1901	126,218	366,376	1924	318,800	1,159,137
1902	115,208	205,876	1925	284,068	949,826
1903	102,895	211,365	1926	311,761	1,124,978
1904	95,968	187,300	1927	263,028	639,127
1905	77,118	141,925	1928	340,580	1,024,656
1906	101,650	213,228	1929	392,039	2,665,436
1907	88,063	310,967	1930	347,945	1,167,487
1908	121,764	281,469			
1909	155,680	414,708	Totals	6,844,748	$21,939,640

SODA

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XX, XXII, XXIII, XXV, XXVI. Bulletins 24, 67, 91. U. S. Geol. Surv., Bull. 717.

The production of sodium salts in California in 1930 included: Soda ash, trona, caustic soda and bicarbonate from plants at Owens Lake, Inyo County, and trona ('sesqui-carbonate,' a double salt of Na_2CO_3 and Na_2CO_3 and $NaHCO_3$) from Searles Lake, San Bernardino County. There were no shipments of salt cake (sulphate) from the Carrizo Plains, San Luis Obispo County, in 1930. The total for the year amounted to 90,122 tons, valued at $1,627,344 compared with the 1929 figures which were 90,649 tons and $1,838,657.

The dense ash and bicarbonate were used mainly in the manufacture of soap, glass, paper, oil refining, sugar refining, and chemicals; and the trona for metallurgical purposes.

Sodium compounds to some extent replace potassium compounds, in glass and soap making, in photography, in match making, in tanning, sugar refining, and in the manufacture of cyanide for extracting gold and silver from their ores.

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Soda Production of California, by Years.

The total output, showing amount and value of these materials in California since the inception of the statistical records of the State Mining Bureau, is given in the table which follows:

Year	Tons	Value	Year	Tons	Value
1894	1,530	$20,000	1914	6,522	$115,396
1895	1,900	47,500	1915	5,799	83,485
1896	3,000	65,000	1916	10,593	264,825
1897	5,000	110,000	1917	24,505	928,578
1898	7,000	154,000	1918	20,447	855,423
1899	10,000	250,000	1919	21,294	721,958
1900	1,000	50,000	1920	32,407	1,164,898
1901	8,000	400,000	1921	14,828	438,996
1902	7,000	50,000	1922	20,084	573,661
1903	18,000	27,000	1923	34,885	764,284
1904	12,000	18,000	1924	32,536	711,796
1905	15,000	22,500	1925	48,625	947,649
1906	12,000	18,000	1926	63,333	1,305,802
1907			1927	62,571	1,478,239
1908	9,600	14,400	1928	80,838	1,469,297
1909	7,712	11,593	1929	90,646	1,838,657
1910	8,125	11,862	1930	90,122	1,627,344
1911	9,023	52,887			
1912	7,200	37,094	Totals	904,986	$16,675,060
1913	1,861	24,936			

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CHAPTER SEVEN

BY COUNTIES

Introductory.

The State of California includes a total area of 158,297 square miles, of which 155,652 square miles are of land. The maximum width is 235 miles, the minimum 148 miles, and the length from the northwest corner to the southeast corner is 775 miles. The state is divided into fifty-eight counties. The 1930 census figures show a total population for California of 5,672,009. Minerals of commercial value exist in every county, and during 1930 some active production was reported to the State Division of Mines from all of the fifty-eight, with one exception.

Rank of Counties in Mineral Yield, 1930.

Of the ten leading counties in point of total value of output for 1930, the first six, Los Angeles, Kern, Ventura, Orange, Santa Barbara, and Kings owe their position mainly to petroleum and natural gas. Los Angeles, due to crude oil, leads all the others, being credited with 57% of the entire state total value for 1930, having passed Kern in 1923, which led for many years. San Bernardino (seventh) owes its place to cement, potash, borax, and mineral water; Riverside (eighth) to cement, brick, clay and miscellaneous stone; Plumas (ninth) to copper; and Alameda (tenth) to miscellaneous stone and brick.

There were twenty-three counties, each having a total mineral production in excess of a million dollars in 1930. Petroleum was an important item in seven; cement and natural gas in five each; gold in four; miscellaneous stone in three; borax in two; and brick and hollow building tile, copper, mineral water, and soda in one each. In point of variety and diversity, San Bernardino County led all others in 1930 with a total of 23 different mineral products on its commercial list; followed by Inyo with twenty-one; Kern with nineteen; San Diego with sixteen; Los Angeles with fifteen; Fresno, Riverside, San Luis Obispo, and Siskiyou with thirteen each; Santa Barbara with twelve; Amador, Placer with eleven each; Butte, Contra Costa, El Dorado, Santa Clara, and Ventura with ten each. The counties with their mineral resources, production for 1930, etc., are considered in detail in the following paragraphs.

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Mineral Production of California, by Counties, 1930

	County	Value		County	Value
1	Los Angeles	$171,616,329	31	El Dorado	$493,2
2	Kern	42,987,977	32	Monterey	452,9
3	Ventura	31,952,052	33	Trinity	437,3
4	Orange	26,335,290	34	Marin	405,5
5	Santa Barbara	24,368,374	35	Imperial	368,0
6	Kings	13,106,843	36	Stanislaus	331,6
7	San Bernardino	10,657,301	37	Sonoma	330,3
8	Riverside	3,220,636	38	Placer	323,7
9	Plumas	3,219,900	39	Tuolumne	318,3
10	Alameda	2,529,337	40	Humboldt	270,6
11	San Mateo	2,499,937	41	Lake	268,3
12	Amador	2,424,687	42	Tulare	253,1
13	Santa Cruz	2,361,954	43	San Luis Obispo	248,1
14	Fresno	2,324,473	44	Siskiyou	235,4
15	Nevada	2,320,233	45	Tehama	226,4
16	Sacramento	2,303,108	46	Del Norte	176,0
17	Inyo	2,260,766	47	Mono	148,9
18	Calaveras	2,083,956	48	Mariposa	143,4
19	Contra Costa	1,643,286	49	Mendocino	123,0
20	San Benito	1,389,490	50	Glenn	61,1
21	San Diego	1,303,047	51	Colusa	50,1
22	Shasta	1,111,146	52	Solano	46,6
23	Yuba	1,018,399	53	Yolo	27,0
24	Santa Clara	884,329	54	San Francisco	23,4
25	Merced	801,900	55	Lassen	18,0
26	San Joaquin	724,862	56	Modoc	16,2
27	Madera	675,782	57	Alpine	2,5
28	Sierra	606,585	58	Sutter	(
29	Butte	539,666			
30	Napa	532,983		Total	$365,604,69

ALAMEDA

Land area: 732 square miles.
Population: 475,153 (1930 census).
Location: East side of San Francisco Bay.
County seat: Oakland.
References: State Mineralogist Report XVII: XVIII: XX XXVI (Oct. 1929).

Alameda County, while in no sense one of the 'mining counties,' comes tenth on the list, with a value of mineral production for 1930 o $2,529,337 and having eight different substances. This was an increas over the 1929 output, which was $3,626,723.

The mineral resources of this county include asbestos, brick, chromite clay, coal, copper, gold, limestone, mineral paint, pyrite, quartz crystals, glass-sand, sandstone, silver, soapstone, and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	Amount	Value
Brick and hollow building tile	------	$307,71
Clay	10,103 tons	20,06
Salt	232,808 tons	694,3
Silver	41 fine oz.	1
Stone, miscellaneous	------	1,436,60
Other minerals*	------	70,56
Total value		$2,529,33

* Includes copper and pyrite.

ALPINE

Land area: 776 square miles.
Population: 236 (1930 census).
Location: On eastern border of state, south of Lake Tahoe.
County seat: Markleeville.
References: State Mineralogist Report XV: XVII: XVIII.

This county lies just south of Lake Tahoe, in the high Sierra Nevada. Transportation is by auto, wagon, or mule back, and facilities in general are lacking to promote development work.

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The mineral resources of this section are varied and the country has not yet been thoroughly prospected. Occurrences of barium, copper, gold, gypsum, lead, limestone, pyrite, rose quartz, silver, tourmaline, and zinc have been noted here.

Commercial production for 1930 was $2,500, being a decrease from the 1929 amount, which was $33,013.

AMADOR

Land area: 601 square miles.
Population: 8494 (1930 census).
Location: East-central part of state—Mother Lode District.
County seat: Jackson.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXIII (April, 1927).

The value of Amador County's mineral production decreased from $2,498,217 in 1929 to $2,424,687 in 1930, placing it twelfth on the list of counties in the state as regards total value of mineral substances marketed. The decrease was due mainly to gold.

Although having an output consisting of eleven different minerals, the leading product, gold, makes up approximately 76% of the total value for the year.

Amador at one time led the state in gold production, though exceeded in 1920–1923 and in 1926–1927 by Yuba and Nevada counties, but in 1925 and 1928 by Yuba only, and in 1929–1930 by Nevada only.

Commercial output for 1930 was as follows:

Substance	*Amount*	*Value*
Clay	74,023 tons	$103,160
Gold	-----	1,840,191
Silver	18,441 fine oz.	7,100
Stone, miscellaneous	-----	388,129
Other minerals*	-----	86,107
Total value		$2,424,687

* Includes brick, coal, copper, lead, marble, platinum.

BUTTE

Land area: 1722 square miles.
Population: 34,010 (1930 census).
Location: North-central portion of state.
County seat: Oroville.
References: State Mineralogist Report XV: XVII: XVIII: XXIV (July, 1928): XXVI (Oct., 1930).

Butte, twenty-ninth county in California in regard to value of its mineral output, reports a commercial production of ten mineral substances having a total value of $539,666 as compared with $584,319 for 1929. Gold was the most important, and its production had the greatest annual value in this county until 1928, when the value of the output of miscellaneous stone passed that of gold.

Butte stands tenth among the gold-producing counties of the state. Among the mineral resources of this section are asbestos, barytes, chromite, gems, gold, limestone, marble, mineral water, platinum group, silver and miscellaneous stone.

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Commercial output for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	353 lbs.	$4
Gold	----	126,85
Silver	1,097 fine oz.	42
Stone, miscellaneous	----	400,23
Other minerals*	----	12,10
Total value		$539,66

* Includes gems (diamonds), mineral water, natural gas, platinum, soapstone.

CALAVERAS

Land area: 1027 square miles.
Population: 6,009 (1930 census).
Location: East-central portion of state—Mother Lode District.
County seat: San Andreas.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXI (April, 1925).

Calaveras County reported production of nine different minerals valued at $2,083,956 during the year 1930, as compared with $2,523,259 for 1929. Cement, stone, gold, and copper are the chief mineral substances. Calaveras County stands eighteenth among the counties in regard to the total value of mineral output for 1930, and eleventh in gold.

The principal mineral resources developed and undeveloped are: Asbestos, chromite, clay, copper, fuller's earth, gold, limestone, marble, mineral paint, mineral water, platinum group, pyrite, quartz crystals, silver, soapstone, and miscellaneous stone.

Commercial output for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	1,857,248 lbs.	$241,44
Gold	----	112,91
Lead	1,297 lbs.	6
Silver	4,038 fine oz.	1,55
Stone, miscellaneous	----	818,50
Other minerals*	----	909,47
Total value		$2,083,95

* Includes cement, gems (quartz crystals), mineral water.

COLUSA

Land area: 1140 square miles.
Population: 10,257 (1930 census).
Location: Sacramento Valley.
County seat: Colusa.
References: State Mineralogist Report XIV: XVII: XVIII: XXV (April, 1929).

Colusa County lies largely in the basin of the Sacramento Valley. Its western border, however, rises into the foothills of the Coast Range of mountains, and its mineral resources—largely undeveloped—include coal, chromite, copper, gypsum, manganese, mineral water, pyrite, quicksilver, sandstone, miscellaneous stone, sulphur, and in some places traces of gold and silver.

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The value of the 1930 mineral production was $50,140, being an increase over the 1929 figure, which was $42,570, giving it fifty-first place in the order of mineral value, and was as follows:

Substance	*Value*
Stone, miscellaneous	$45,900
Other minerals*	4,240
Total value	$50,140

* Includes petroleum, quicksilver, sulphur.

CONTRA COSTA

Land area: 714 square miles.
Population: 78,554 (1930 census).
Location: East side of San Francisco Bay.
County seat: Martinez.
References: State Mineralogist Report XVII : XVIII : XXIII (Jan., 1927).

Contra Costa, like Alameda County, lies on the eastern shore of San Francisco Bay, and is not commonly considered among the mineral producing counties of the state. It stands nineteenth on the list in this respect, with an output valued at $1,643,286 for 1930 as compared with $1,827,956 in 1929.

Various structural materials make up the chief items, including brick, cement, limestone, and miscellaneous stone. Among the others are asbestos, clay, coal, gypsum, manganese, mineral water, and soapstone.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Gold	------	$102,036
Silver	199,186 fine oz.	76,687
Stone, miscellaneous	------	398,613
Other minerals*	------	1,065,950
Total value		$1,643,286

* Includes brick and hollow building tile, cement, clay (pottery), mineral water, quicksilver, silica (glass sand).

DEL NORTE

Land area: 1024 square miles.
Population: 4734 (1930 census).
Location: Extreme northwest corner of state.
Transportation: Motor, wagon and mule back; steamer from Crescent City.
County seat: Crescent City.
References: State Mineralogist Report XIV: XVII: XXI (July, 1925).

Del Norte almost rivals Alpine County in regard to inaccessibility. Like the latter county, also, given transportation and kindred facilities, this portion of the state presents a field for development along mining lines especially. Its chief mineral resources, largely untouched, are chromite, copper, gems, gold, iron, platinum group, silver, and miscellaneous stone.

The 1930 output was an increase from the figure of $84,263 in 1929, the principal item of which is crushed rock used on highway construction, and rock used on the Crescent City harbor jetty.

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Commercial production for 1930, giving it forty-sixth place, was as follows:

Substance	*Amount*	*Value*
Gold	--	$279
Silver	2 fine oz.	1
Stone, miscellaneous	--	175,227
Unapportioned	--	523
Total value		$176,030

EL DORADO

Land area: 1753 square miles.
Population: 8303 (1930 census).
Location: East-central portion of the state, northernmost of the Mother Lode counties.
County seat: Placerville.
References: State Mineralogist Report XV: XVII: XVIII: XIX: XX: XXII (Oct., 1926).

El Dorado County, which contains the locality where gold in California was first heralded to the world, comes thirty-first on the list of counties ranked according to the value of their total mineral production during the year 1930. In addition to the segregated figures here given, a large tonnage of limestone is annually shipped from El Dorado for use in cement manufacture, and whose value is included in the state total for cement. The 1930 mineral production of ten different mineral substances valued at $493,243 was an increase over the 1929 output worth $367,500 in 1929.

The mineral resources of this section, many of them undeveloped, include asbestos, barytes, chromite, clay, copper, gems, gold, iron, molybdenum, limestone, quartz crystals, quicksilver, slate, soapstone, silver, and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Gold	-----	$78,019
Limestone	88,869 tons	205,225
Silver	650 fine oz.	250
Stone, miscellaneous	-----	96,599
Other minerals*	-----	113,105
Total value		$493,243

* Includes lead, lime, silica (quartz), slate, soapstone.

FRESNO

Land area: 5950 square miles.
Population: 144,369 (1930 census).
Location: South-central portion of state.
County seat: Fresno.
References: State Mineralogist Report XIV: XVII: XVIII: XXV (July, 1929).

Fresno County, fourteenth in importance as a mineral producer among the counties of California, reports an output for 1930 of thirteen different mineral substances, with a total value of $2,324,473, a decrease from the 1929 production, which was worth $2,413,495.

Commercial production for 1930 was as follows:

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Substance	Amount		Value
Gold	-------		$5,916
Natural gas	393,337	M cu. ft.	26,108
Petroleum	3,362,902	bbls.	1,910,128
Quicksilver	147	flasks	13,418
Silver	55	fine oz.	21
Other minerals*	-------		368,882
Total value			$2,324,473

* Includes brick and hollow building tile, diatomaceous earth, granite, gypsum, mineral water, volcanic ash, miscellaneous stone.

GLENN

Land area: 1259 square miles.
Population: 10,935 (1930 census).
Location: West side of Sacramento Valley.
County seat: Willows.
References: State Mineralogist Report XIV: XVII: XVIII.

Glenn County, standing fiftieth, owes its position among the mineral-producing counties of the state mainly to the presence of large deposits of sand and gravel which are annually worked, the product being used for railroad ballast, etc. In 1917 and 1918, chromite was also an important item. In the foothills in the western portion of the county, deposits of chromite, copper, manganese, sandstone, and soapstone have been found.

Commercial production for 1930 was as follows, being a decrease from $81,516 of the previous year:

Substance	Value
Stone, miscellaneous	$61,179

HUMBOLDT

Land area: 3634 square miles.
Population: 43,189 (1930 census).
Location: Northwestern portion of state, bordering on Pacific Ocean.
County seat: Eureka.
References: State Mineralogist Report XIV: XVII: XVIII: XXI (July, 1925.)

Humboldt County is almost entirely mountainous, transportation within its limits being very largely by auto and wagon road, and trail, and until 1915, when railroad communication was established with the outside world, the only method of outside communication was by steamer. The county is rich in mineral resources, among which are brick, chromite, coal, clay, copper, gold, iron, mineral water, natural gas, petroleum, platinum, silver, and miscellaneous stone.

Humboldt ranks fortieth in the value of its mineral output among the counties of the state for 1930 with nine different mineral substances, valued at $270,633 as compared with 1929 output valued at $293,678.

Commercial production for 1930 was as follows:

Substance	Amount		Value
Gold	--		$2,255
Silver	24	fine oz.	9
Stone, miscellaneous	--		263,025
Other minerals*	--		5,344
Total value			$270,633

* Includes brick, clay (pottery), natural gas, platinum.

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IMPERIAL

Land area: 4089 square miles.
Population: 60,894 (1930 census).
Location: Extreme southeast corner of the state.
County seat: El Centro.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXII (April, 1926).

During 1930 Imperial County produced six mineral substances having a total value of $368,023, a decrease from the 1929 output, which was $509,832. It ranks thirty-fifth in total value of mineral production for the year. This county contains deposits of cyanite, gold, gypsum, lead, manganese, marble, pumice, salt, silver, sodium, and strontium, largely developed.

Commercial production for 1930 was as follows:

Substance	*Value*
Gold	$14[illegible]
Stone, miscellaneous	218,68[illegible]
Other minerals*	149,18[illegible]
Total value	$368,02[illegible]

* Includes gypsum, pumice, cyanite.

INYO

Land area: 10,019 square miles.
Population: 6557 (1930 census).
Location: Lies on eastern border of state, north of San Bernardino County.
County seat: Independence.
References: State Mineralogist Report XV: XVII: XVIII: XX: XXII (Oct., 1926).

Inyo, the second largest county in the state, and containing less than one inhabitant per square mile, is extremely interesting from a mineralogical point of view. It is noted because of the fact that within its borders are located both the highest point, Mount Whitney (elevation 14,502 feet), and the lowest point, Death Valley (elevation 290 feet below sea level), in the United States. In the higher mountainous sections are found many vein-forming minerals, and in the lake beds of Death Valley saline deposits exist.

Inyo's mineral production during the year 1930 reached a value of $2,260,766, standing seventeenth among the counties of the state in this respect. Twenty-one different mineral substances were produced. The 1929 output was valued at $2,296,210. Its mineral resources include antimony, asbestos, barytes, borates, copper, dolomite, gems, gold, gypsum, lead, marble, soda, sulphur, talc, tungsten and zinc.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	19,607 lbs.	$2,549
Gold	--------	20,466
Lead	3,452,159 lbs.	172,608
Silver	111,587 fine oz.	42,961
Soda	67,119 tons	1,273,098
Stone, miscellaneous	--------	310,675
Other minerals*	--------	438,409
Total value		$2,260,766

* Includes barytes, borax, clay (bentonite), dolomite, gems, 'granite' (tuff), lime, marble, mineral water, pumice, salt, silica (quartz), talc, tungsten.

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KERN

Land area: 8003 square miles.
Population: 82,219 (1930 census).
Location: South-central portion of state.
County seat: Bakersfield.
References: State Mineralogist Report XIV: XVII: XVIII: XXIX: XX: XXV (Jan., 1929).

Kern County, because of its immensely productive oil fields, for many years stoood preeminent among all counties of California in the value of its mineral output, the exact figures for 1930 being $42,987,977. Kern was surpassed by both Los Angeles and Orange counties in 1923, but by Los Angeles only in 1924–1930, for which petroleum also is responsible. The 1929 mineral output for this county was worth $38,809,239. The increase was due to a larger quantity of crude oil. During 1930 nineteen different mineral substances were produced.

The mineral resources of this section, many of them undeveloped, include asbestos, barytes, chromite, clay, copper, gems, gold, iron, molybdenum, limestone, quartz crystals, quicksilver, slate, soapstone, silver, and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Borax	111,301 tons	$2,335,190
Clay	371,123 tons	117,834
Gold	----------	165,435
Natural gas	27,908,423 M cu. ft.	1,290,090
Petroleum	44,170,810 bbls.	37,015,139
Silver	4,564 fine oz.	1,757
Stone, miscellaneous	----------	450,351
Other minerals*	----------	1,612,181
Total value		$42,987,977

* Includes brick, cement, copper, feldspar, fuller's earth, gems (rose quartz), gypsum, lead, quicksilver, salt, volcanic ash.

KINGS

Land area: 1559 square miles.
Population: 25,277 (1930 census).
Location: South-central portion of the state.
County seat: Hanford.
References: State Mineralogist Report XIV: XVII: XVIII: XXVI (Oct., 1930).

Little development has taken place in Kings County along mineral lines to date. Deposits of fuller's earth, gypsum, mineral paint, natural gas, and quicksilver, of undetermined extent, have been found in the county. Drilling for oil has been under way, and commercial output recorded for the first time in 1926.

Tulare Lake is in Kings County, though now largely drained, and the land under cultivation.

Kings County advanced from ninth position in 1929 to seventh in value of mineral production for 1930, accounted for by the bringing in of further oil wells at Kettleman Hills, which began commercial yield in 1928.

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Commercial output for 1930 was as follows:

Substance	*Amount*	*Value*
Natural gas	47,959,591 M cu. ft.	$3,668,7
Petroleum	6,176,130 bbls.	9,437,7
Unapportioned	---	3
Total value		$13,106,8

LAKE

Land area: 1278 square miles.
Population: 7166 (1930 census).
Location: About fifty miles north of San Francisco Bay and th same distance inland from the Pacific Ocean.
County seat: Lakeport.
References: State Mineralogist Report XIV: XVII: XVIII: XX XXV (July, 1929).

On account of its topography and natural beauties, Lake County i sometimes referred to as the Switzerland of America. The minera resources which exist here are many and varied, actual productio being comparatively small, as shown by the table below, and in the pas composed mainly of quicksilver and mineral water. Some of the lead- ing minerals found in this section, in part as yet undeveloped, ar asbestos, borax, chromite, clay, copper, gems, gold, gypsum, minera water, quicksilver, silver, and sulphur.

Lake County was in forty-first place as to value of mineral output Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Mineral water	36,758 gals.	$14,52
Quicksilver	1,760 flasks	195,71
Stone, miscellaneous	---	58,05
Unapportioned	---	7
Total value		$268,36

LASSEN

Land area: 4531 square miles.
Population: 12,587 (1930 census).
Location: Northeast portion of state.
County seat: Susanville.
References: State Mineralogist Report XV: XVII: XVIII: XIX XXV (Jan., 1929).

Lassen County is one of the only partly-developed sections of Cali- fornia. Since about 1912 a railroad traversing the county north and south has been in operation, thus affording opportunity for develop- ment along mineral and other lines.

Among the mineral resources of this county are copper, gems, gyp- sum, gold, silver, and sulphur. In the past, some gold had been pro- duced, but not for some years, until 1921, when the yield again became important. In fifty-fifth place, commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Gold	---	$2,94
Silver	59 fine oz.	2
Stone, miscellaneous	---	14,60
Unapportioned	---	52
Total value		$18,09

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LOS ANGELES

Land area: 4067 square miles.
Population: 2,201,526 (1930 census).
Location: One of the southwestern coast counties.
County seat: Los Angeles.
References: State Mineralogist Report XV: XVII: XVIII: XIX: XX: XXIII (July, 1927).

Mineral production in Los Angeles County for the year 1930 amounted in value to $171,616,329, as compared to the 1929 output worth $243,568,275. This accounted for 57% of the entire state's total for 1930 and ranks Los Angeles first in the state as a mineral producer, having in 1923 passed Kern County, which had previously been leading for several years. The decrease in 1930 was due to petroleum.

Among the mineral resources may be noted asphalt, barytes, borax, brick, clay, fuller's earth, gems, gold, gypsum, infusorial earth, limestone, marble, mineral paint, mineral water, natural gas, petroleum, salt, glass-sand, sandstone, serpentine, silver, soapstone, and miscellaneous stone. Some potash has been obtained from kelp.

Commercial production for 1930, consisting of fifteen substances, was as follows:

Substance	*Amount*		*Value*
Brick	172,468	M	$1,677,406
Hollow building tile	28,783	tons	198,478
Clay (pottery)	78,643	tons	70,693
Mineral water	23,695,673	gals.	2,152,928
Natural gas	156,470,411	M cu. ft.	14,065,968
Petroleum	114,533,366	bbls.	148,549,776
Sandstone	----------		22,292
Stone, miscellaneous	----------		4,731,302
Other minerals*	----------		147,486
Total value			$171,616,329

* Includes diatomaceous earth, 'granite,' lead, salt, soapstone, paving blocks.

MADERA

Land area: 2112 square miles.
Population: 17,152 (1930 census).
Location: East-central portion of state.
County seat: Madera.
References: State Mineralogist Report XIV: XVII: XVIII: XXIV (Oct., 1928).

Madera County produced six different mineral substances during the year 1930, having a total value of $675,782, as compared with the 1929 output worth $1,027,410, the increase being due to granite. This county contains deposits of copper, gold, granite, iron, lead, molybdenum, pumice, silver, and miscellaneous stone.

In twenty-seventh place, commercial production for 1929 was as follows:

Substance	*Amount*		*Value*
Copper	98	lbs.	$13
Gold	----		1,062
Lead	4,993	lbs.	250
Silver	183	fine oz.	70
Other minerals*	----		674,387
Total value			$675,782

* Includes granite and miscellaneous stone.

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MARIN

Land area: 529 square miles.
Population: 41,635 (1930 census).
Location: Adjoins San Francisco on the north.
County seat: San Rafael.
References: State Mineralogist Report XIV: XVII: XVIII: XXII (July, 1926).

Mineral production in Marin County during 1930 amounted to $405,541, compared with $470,002 in 1929.

This county is not especially prolific in minerals, although among its resources along these lines are brick, gems, manganese, mineral water, soapstone, and miscellaneous stone.

In thirty-fourth place, commercial production for 1930 was as follows:

Substance	*Value*
Unapportioned*	$405,541

* Includes brick, mineral water, miscellaneous stone.

MARIPOSA

Land area: 1453 square miles.
Population: 2530 (1930 census).
Location: Most southerly of the Mother Lode counties. East-central portion of state.
County seat: Mariposa.
References: State Mineralogist Report XIV: XVII: XVIII: XIV (April, 1928).

Mariposa County is one of the distinctly 'mining' counties of the state, although it stands but forty-eighth on the list of counties in regard to the value of its mineral output for 1930, with a total of $143,465, as compared with $244,017 in 1929.

Its mineral resources are varied, among the more important items being barytes, copper, gems, gold, lead, marble, silver, slate, soapstone, and miscellaneous stone.

The Yosemite Valley is in Mariposa County.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	3,629 lbs.	$472
Gold	----	58,985
Silver	826 fine oz.	318
Stone, miscellaneous	----	15,133
Other minerals*	----	68,557
Total value		$143,465

* Includes barytes, granite, lead.

MENDOCINO

Land area: 3453 square miles.
Population: 23,491 (1930 census).
Location: Joins Humboldt County on the south and bounded by the Pacific Ocean on the west.
County seat: Ukiah.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX.

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Mendocino County's annual mineral production has usually been small, the 1930 output being valued at $123,062, ranking forty-ninth among the counties, as compared with $59,000 in 1929.

Deposits of, in part undetermined value, of asbestos, chromite, coal, copper, graphite, magnesite, and mineral water have been found, as well as traces of gold, platinum, and silver.

Commercial production for 1930 was as follows:

Substance	*Value*
Stone, miscellaneous	$119,429
Other minerals*	3,633
Total value	$123,062

* Includes brick, limestone, natural gas.

MERCED

Land area: 1995 square miles.
Population: 36,900 (1930 census).
Location: About the geographical center of the state.
County seat: Merced.
References: State Mineralogist Report XIV: XVII: XVIII: XXI (April, 1925).

Merced County as a whole lies in the San Joaquin Valley and it figures as one of the lesser mineral producing counties of the state. The 1930 mineral output was valued at $801,900, compared with $1,110,498 in 1929, the decrease being due to cement.

Gold, platinum, and silver were formerly obtained in important amounts by dredging, which ceased in this county in 1918, though a small yield from other sources is still occasionally had. Undeveloped deposits of antimony, magnesite, quicksilver, and limestone have been noted in this county in addition to the foregoing.

In twenty-fifth place, commercial production during 1930 was as follows:

Substance	*Amount*	*Value*
Gold	---	$88,328
Silver	378 fine oz.	146
Stone, miscellaneous	---	29,250
Other minerals*	---	684,176
Total value		$801,900

* Includes brick and hollow building tile, cement, clay (pottery), lead.

MODOC

Land area: 3823 square miles.
Population: 8038 (1930 census).
Location: The extreme northeast corner of the state.
County seat: Alturas.
References: State Mineralogist Report XV: XVII: XVIII: XXV (Jan., 1929.)

Modoc County, like Lassen, has only in recent years had the benefit of communication with the outside world by rail. Among its known mineral resources are clay, coal, gold, iron, quicksilver, salt, and silver.

In fifty-sixth place, commercial production for 1930 was as follows:

Substance	*Value*
Mineral output*	$16,250

* Includes miscellaneous stone and salt.

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MONO

Land area: 3030 square miles.
Population: 1359 (1930 census).
Location: Is bordered by the state of Nevada on the east and is about in the central portion of the state measured on a north and south line.
County seat: Bridgeport.
References: State Mineralogist Report XV: XVII: XVIII: XX XXIII (Oct., 1927).

Gold mining has been carried on in portions of Mono County for many years, although, taken as a whole, it lies in a somewhat inaccessible country so far as rail transportation is concerned. It is in the continuation of the heavily mineralized belt which was noted in Inyo County and contains among other mineral resources andalusite, barytes, clay, copper, gold, limestone, molybdenum, pumice, salt, silver, and travertine.

In forty-seventh place with seven different substances, commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	2,006 lbs.	$2[illegible]
Gold	----	26,2[illegible]
Silver	8,224 fine oz.	3,1[illegible]
Stone, miscellaneous	----	19,7[illegible]
Other minerals*	----	99,5[illegible]
Total value		$148,9[illegible]

* Includes pumice and andalusite.

MONTEREY

Land area: 3330 square miles.
Population: 53,668 (1930 census).
Location: West-central portion of state, bordering on Pacific Ocean.
County seat: Salinas.
References: State Mineralogist Report XV: XVII: XVIII: XIX XXI (Jan., 1925).

Monterey County produced twelve different mineral substances during 1930, having a total value of $452,974, as compared with the 1929 output worth $354,858. Its mineral resources include brick, clay, copper, coal, diatomaceous earth, dolomite, feldspar, fuller's earth, gold, gypsum, limestone, mineral water, petroleum, quicksilver, glass sand, sandstone, silver, and miscellaneous stone.

In thirty-second place, commercial production for 1930 was as follows:

Substance	*Value*
Sandstone	$30,50[illegible]
Stone, miscellaneous	233,97[illegible]
Other minerals*	188,50[illegible]
Total value	$452,97[illegible]

* Includes asbestos, clay (pottery), coal, diatomaceous earth, dolomite, quicksilver, salt, silica (glass sand), paving blocks.

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NAPA

Land area: 783 square miles.
Population: 22,832 (1930 census).
Location: Directly north of San Francisco Bay—one of the 'bay counties.'
County seat: Napa.
References: State Mineralogist Report XIV: XVII: XVIII: XX: XXV (April, 1929).

Napa, because of its production of structural and industrial materials and mineral water, stands thirtieth on the list of mineral-producing counties in California. Its mineral resources include chromite, copper, magnesite, mineral water, quicksilver, silver, sandstone, and miscellaneous stone. This county has been one of the important producers of quicksilver.

In 1930 the value of the output was $532,983, as compared with the 1929 output, worth $649,822.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	9,257 lbs.	$1,203
Gold	------	36,532
Lead	464 lbs.	23
Mineral water	43,902 gals.	13,837
Quicksilver	2,000 flasks	213,840
Silver	266,386 fine oz.	102,559
Other minerals*	------	164,989
Total value		$532,983

* Includes sandstone and miscellaneous stone.

NEVADA

Land area: 974 square miles.
Population: 10,589 (1930 census).
Location: North of Lake Tahoe, on the eastern border of the state.
County seat: Nevada City.
References: State Mineralogist Report XVI: XVII: XVIII: XIX: XX: XXVI (April, 1930).

Nevada, one of the mountain counties of California, for some years alternated with Amador in the gold lead, but both were passed by Yuba in 1918–1921, also 1923. In 1922, 1924, 1929 and 1930, Nevada led all counties in gold output, but it held third place in 1925 and 1928, and second place in 1926 and 1927. Nevada County stands fifteenth on the list of counties in regard to value of its total mineral output for 1930, with a production worth $2,320,233, as compared with the 1929 production worth $1,980,028, the increase being due to gold.

While this county actually produces mainly gold and silver, its resources cover a wide scope, including antimony, asbestos, barytes, chromite, clay, copper, gems, iron, lead, mineral paint, pyrites, soapstone, and tungsten.

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Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	17,009 lbs.	$2,2
Gold	-----	2,193,4
Lead	18,164 lbs.	9
Silver	60,561 fine oz.	23,8
Stone, miscellaneous	-----	76,8
Other minerals*	-----	23,4
Total value		$2,320,2

* Includes barytes and platinum.

ORANGE

Land area: 795 square miles.
Population: 118,611 (1930 census).
Location: Southwestern portion of state, bordering Pacific Ocean
County seat: Santa Ana.
References: State Mineralogist Report XV: XVII: XVIII: XIX XX: XXI (Jan., 1925).

Orange County is one of the many in California which on casual inspection appears to be anything but a mineral-producing section. It stood for many years, however, as the second county in the state in regard to the total value of mineral output, on account of its highly productive oil fields. It was passed in 1922 by Los Angeles, the credit for which is also due to oil, and in turn Orange passed Kern County in 1923, but dropped back to third in 1924–1928, and dropped to fourth place in 1929 and 1930, being passed by Ventura County.

This county showed a mineral production for 1930 of $26,335,29 compared with the 1929 output worth $28,461,495, the decrease being due to decreased petroleum output.

Orange passed Shasta County in 1917, which previously for a number of years had exceeded all other counties in California, except Kern.

Aside from the substances actually produced and noted in the table below, coal, gypsum, iron, infusorial earth, sandstone, silver, tourmaline and zinc have been found in Orange County.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	18,224 tons	$78,3
Natural gas	21,518,952 M cu. ft.	1,394,6
Petroleum	23,113,820 bbls.	24,500,6
Stone, miscellaneous	---------	252,5
Other minerals*	---------	109,1
Total value		$26,335,29

* Includes brick and mineral water.

PLACER

Land area: 1395 square miles.
Population: 24,442 (1930 census).
Location: Eastern border of state directly west of Lake Tahoe.
County seat: Auburn.
References: State Mineralogist Report XV: XVII: XVIII: XIX XX: XXIII (July, 1927).

While standing only thirty-eighth on the list of mineral-producing counties, Placer contains a wide variety of mineral substances, some of which have not been commercially exploited. Its leading product

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include gold, chromite, granite, copper, and clay. Other mineral resources are asbestos, brick, coal, gems, iron, lead, limestone, magnesite, manganese, marble, quartz crystals, glass sand, silver and miscellaneous stone.

Commercial production for 1930 was as follows, compared to a total value of $266,347 for the previous year:

Substance	*Amount*	*Value*
Clay (pottery)	85,377 tons	$116,642
Gold	-----	29,338
Granite	9,246 cu. ft.	15,841
Silver	189 fine oz.	73
Stone, miscellaneous	-----	133,339
Other minerals*	-----	28,484
Total value		$323,717

* Includes brick and hollow building tile, copper, mineral paint, silica (quartz), chromite.

PLUMAS

Land area: 2594 square miles.
Population: 7909 (1930 census).
Location: Northeastern border of state, south of Lassen County.
County seat: Quincy.
References: State Mineralogist Report XVI: XVII: XVIII: XIX: XX: XXIV (Oct., 1928).

A considerable portion of the area of Plumas County lies in the high mountains, and deposits of the metals, especially gold and copper, are found there. Mineral production for 1930 was valued at $3,219,900 compared with $5,137,968 in 1929. The decrease was due to copper. This placed the county ninth in rank. In 1919 Plumas passed Shasta in the copper lead, owing to the Shasta smelters being closed down, which position Plumas still retains.

Among its mineral resources are chromite, copper, gold, granite, iron, lead, limestone, manganese, molybdenum, platinum, silver, and zinc.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	19,529,224 lbs.	$2,538,799
Gold	-----	405,359
Lead	491 lbs.	25
Silver	426,038 fine oz.	164,025
Stone, miscellaneous	-----	106,900
Other minerals*	-----	4,792
Total value		$3,219,900

* Includes granite and manganese ore.

RIVERSIDE

Land area: 7240 square miles.
Population: 82,078 (1930 census).
Location: Southern portion of state.
County seat: Riverside.
References: State Mineralogist Report XV: XVII: XVIII: XX: XXV (Oct., 1929).

Riverside is the fourth county in the state in size and the eighth in regard to the total value of mineral output for 1930. Within its borders are included mountain, desert, and agricultural land. Its mineral resources include metals, structural and industrial materials, and

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salines, some of the more important being brick, clay, coal, copper, feldspar, gold, gypsum, iron, lead, limestone, manganese, magnesite, marble, mineral paint, mineral water, salt, soapstone, silver, miscellaneous stone, and tin. In point of variety, Riverside County showed thirteen different minerals commercially produced in 1930. The decrease in 1930 from the 1929 output, valued at $5,401,860, was due to cement, brick, and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	102,419 tons	$180,72[illegible]
Copper	5,878 lbs.	76[illegible]
Feldspar	283 tons	1,74[illegible]
Gold	------	4,8[illegible]
Silver	100 fine oz.	[illegible]
Silica (quartz and glass sand)	4,217 tons	17,67[illegible]
Stone, miscellaneous	------	284,07[illegible]
Other minerals*	------	2,730,78[illegible]
Total value		$3,220,63[illegible]

* Includes asbestos (amphibole), brick and hollow building tile, cement, gypsum granite, mineral water.

SACRAMENTO

Land area: 983 square miles.
Population: 141,915 (1930 census).
Location: North-central portion of state.
County seat: Sacramento.
References: State Mineralogist Report XV: XVII: XVIII: XX: XXI (Jan., 1925).

Sacramento stands sixteenth among the counties of the state as a mineral producer, the output, principally gold, for 1930 being valued at $2,303,108, as compared with the 1929 production worth $2,247,302. In regard to gold output alone, this county ranks third, being exceeded only by Nevada and Amador counties, the Sacramento product coming from the dredges. Its mineral resources include brick, clay, gold, granite, natural gas, platinum, silver and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Brick and hollow building tile	----	$195,80[illegible]
Gold	----	1,724,71[illegible]
Granite	----	7,75[illegible]
Silver	3,411 fine oz.	1,81[illegible]
Stone, miscellaneous	----	346,19[illegible]
Other minerals*	----	27,33[illegible]
Total value		$2,303,10[illegible]

* Includes clay (pottery), natural gas, platinum.

SAN BENITO

Land area: 1392 square miles.
Population: 11,310 (1930 census).
Location: West-central portion of state.
County seat: Hollister.
References: State Mineralogist Report XV: XVII: XVIII: XX: XXII (April, 1926).

While twentieth among the counties of the state in regard to value of total mineral production for 1930, San Benito has led for some years in one important branch of the mineral industry, namely, quicksilver. Cement is also an important item.

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Its other mineral resources, many of them undeveloped, include antimony, asbestos, bituminous rock, chromite, coal, dolomite, gems, gypsum, limestone, magnesite, mineral water, and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Value*
Unapportioned*	$1,389,490

* Includes cement, lime, magnesite, quicksilver, miscellaneous stone.

SAN BERNARDINO

Land area: 20,157 square miles.
Population: 133,827 (1930 census).
Location: Southeastern portion of state.
County seat: San Bernardino.
References: State Mineralogist Report XV: XVII: XVIII: XIX: XXVI (July, 1930): XXVII (July, 1931).

San Bernardino, by far the largest county in the state in area, ranks seventh as regards the value of its mineral output for 1930, with a total of $10,657,301, as compared with the 1929 total of $11,210,652. The decrease is mainly due to cement.

San Bernardino for several years (except 1918) has led all other counties in the state in point of variety of minerals, producing commercially during 1930 a total of 23 different substances. This county also ranks first as a silver producer in the state, from the mines of the Randsburg district.

This county, consisting largely of mountain and desert country, is highly mineralized, the following being included among its resources: Asbestos, barytes, borax, brick, cement, clay, copper, gems, gold, granite, gypsum, iron, lead, limestone, manganese, marble, mineral paint, mineral water, nitre, potash salt, soapstone, soda, miscellaneous stone, strontium, talc, tungsten, vanadium, and zinc.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	2,013 tons	$14,916
Copper	40,622 lbs.	5,281
Gold	------	59,442
Lead	45,653 lbs.	2,283
Silver	463,625 fine oz.	178,496
Stone, miscellaneous	------	406,912
Other minerals*	------	9,989,971
Total value		$10,657,301

* Includes barytes, borates, brick, calcium chloride, cement, fuller's earth, gems, lime, limestone, manganese ore, mineral water, potash, salt, soda, talc, tungsten.

SAN DIEGO

Land area: 4221 square miles.
Population: 209,477 (1930 census).
Location: Extreme southwest corner of state.
County seat: San Diego.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXI (July, 1925).

San Diego ranks twenty-first in the total value of its mineral output for the year, with 16 different commercial minerals. The value

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for 1930 equaled $1,303,047, as compared with the 1929 output worth $1,447,287.

In the production of semiprecious gems, San Diego County has led the state. Aside from minerals commercially produced, as shown below, San Diego County contains occurrences of bismuth, lithia, marble, nickel, soapstone, and tin. Potash has been produced from kelp.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	15,517 tons	$25,7
Fuller's earth	5,297 tons	55,6
Gold	-----	2,2
Granite	9,986 cu. ft.	27,4
Silver	27 fine oz.	
Stone, miscellaneous	-----	651,9
Other minerals*	-----	539,9
Total value		$1,303,0

* Includes brick and hollow building tile, bromine, feldspar, gems, magnesium salts mineral water, salt, silica (quartz), tube mill pebbles.

SAN FRANCISCO

Land area: 46½ square miles.
Population: 637,212 (1930 census).
County seat: San Francisco.
References: State Mineralogist Report XVII: XVIII: XX: XX (April, 1929).

Surprising as it may appear at first glance, San Francisco County is listed among the mineral producing sections of the state, actual production consisting mainly of crushed rock, sand and gravel. Small quantities of various valuable mineral substances are found here, including cinnabar, gypsum, lignite, and magnesite, none, however, in paying quantities. Some pumice has been produced.

In fifty-fourth place, commercial production for 1930 was as follows:

Substance	*Value*
Unapportioned	$23,4

SAN JOAQUIN

Land area: 1448 square miles.
Population: 102,871 (1930 census).
Location: Central portion of state.
County seat: Stockton.
References: State Mineralogist Report XIV: XVII: XVIII: XXI (April, 1925).

San Joaquin County reported a mineral production for the year 1930 having a total value of $724,862 as compared with the 1929 output worth $789,891.

Comparatively few mineral substances are found here, the chief ones being brick, clay, manganese, natural gas, glass-sand, and miscellaneous stone. Gold, platinum and silver have been obtained by dredging in the Mokelumne River, which forms the boundary between this county and Amador on the northeast.

In twenty-sixth place, commercial production for 1930 was as follows:

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Substance	Amount	Value
Brick	11,858 M	$478,454
Stone, miscellaneous	-----	202,307
Unapportioned	-----	44,101
Total value		$724,862

SAN LUIS OBISPO

Land area: 3334 square miles.
Population: 29,617 (1930).
Location: Bordered by Kern County on the east and the Pacific Ocean on the west.
County seat: San Luis Obispo.
References: State Mineralogist Report XV: XVII: XVIII: XXI (Oct., 1925).

The total value of the mineral production of San Luis Obispo County in 1930 was $248,115, as compared with the 1929 output, worth $191,084.

Among its mineral resources, both developed and undeveloped, are asphalt, bituminous rock, brick, chromite, coal, copper, diatomaceous earth, gypsum, iron, limestone, marble, mineral water, onyx, petroleum, quicksilver, soda and miscellaneous stone.

In forty-third place, commercial production for 1930 was as follows:

Substance	Amount	Value
Gold	----	$1,461
Quicksilver	1,306 flasks	157,440
Silver	3 fine oz.	1
Stone, miscellaneous	----	28,659
Other minerals*	----	60,554
Total value		$248,115

* Includes brick and hollow building tile, chromite, clay (pottery), 'granite' (tuff), marble (flagstone), mineral water, petroleum, volcanic ash.

SAN MATEO

Land area: 447 square miles.
Population: 77,338 (1930 census).
Location: Peninsula, adjoined by San Francisco on the north.
County seat: Redwood City.
References: State Mineralogist Report XVII: XVIII: XXV (April 1929).

San Mateo's most important mineral products are cement, stone and salt, the last named being derived by evaporation from the waters of San Francisco Bay. The total value of all mineral production during 1930 equaled $2,499,937, as compared with the 1929 figures of $3,672,779, the decrease being due to cement.

Small amounts of barytes, chromite, infusorial earth, and quicksilver have been noted in addition to the items of economic value given below. Bricks have also been produced commercially.

In eleventh place, commercial production for 1930 was as follows:

Substance	Value
Stone, miscellaneous	$340,490
Other minerals*	2,159,447
Total value	$2,499,937

* Includes cement, limestone (shells), magnesium salts, natural gas, salt.

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SANTA BARBARA

Land area: 2740 square miles.
Population: 65,075 (1930 census).
Location: Southwestern portion of state, adjoining San Luis Obispo on the south.
County seat: Santa Barbara.
References: State Mineralogist Report XV: XVII: XVIII: XIX: XXI (Oct., 1925).

Santa Barbara County owes its position of fifth in the state in regard to its mineral output to the presence of productive oil fields within its boundaries. The total value of its mineral production during the year 1930 was $24,368,379 as compared with the 1929 output of $16,407,136 and included twelve different mineral substances. The increase was due to petroleum and natural gas.

Aside from the mineral substances listed below, Santa Barbara County contains asphalt, gilsonite, gypsum, magnesite, and quicksilver in more or less abundance.

Commercial production for 1930 was as follows:

Substance	*Amount*		*Value*
Brick and hollow building tile	----------		$14,9[illegible]
Natural gas	6,274,436	M cu. ft.	299,9[illegible]
Petroleum	15,914,132	bbls.	22,343,4[illegible]
Stone, miscellaneous	----------		202,9[illegible]
Other minerals*	----------		1,507,0[illegible]
Total value			$24,368,3[illegible]

* Includes barytes, bituminous rock, clay (pottery), diatomaceous earth, marble (flagstone), mineral water, quicksilver.

SANTA CLARA

Land area: 1328 square miles.
Population: 144,921 (1930 census).
Location: West-central portion of state.
County seat: San José.
References: State Mineralogist Report XVII: XVIII: XX: XXI (Jan., 1930).

Santa Clara County reported a mineral output for 1930 of $884,32[illegible] as compared with the 1929 figures of $963,478.

This county, lying largely in the Coast Range Mountains, contains a wide variety of mineral substances, including brick, chromite, clay, limestone, magnesite, manganese, mineral water, petroleum, quicksilver, soapstone, and miscellaneous stone.

In twenty-fourth place, commercial production for 1930 was as follows:

Substance	*Amount*		*Value*
Brick	11,592	tons	$113,15[illegible]
Clay (pottery)	3,607	tons	2,2[illegible]
Stone, miscellaneous	-----		409,7[illegible]
Other minerals*	-----		359,2[illegible]
Total value			$884,32[illegible]

* Includes limestone (shells), magnesite, mineral water, natural gas, petroleum, quicksilver.

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SANTA CRUZ

Land area: 435 square miles.
Population: 37,405 (1930 census).
Location: Bordering Pacific Ocean, just south of San Mateo County.
County seat: Santa Cruz.
References: State Mineralogist Report XVII: XVIII: XXII (Jan., 1926).

The mineral output of Santa Cruz County, a portion of which is itemized below, amounted to a total value of $2,361,954, giving the county a standing of thirteenth among all others in the state in this regard. This is a decrease from the 1929 figure of $3,327,633.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Limestone	11,405 tons	$46,925
Stone, miscellaneous	-----	79,218
Other minerals*	-----	2,235,811
Total value		$2,361,954

* Includes bituminous rock, cement, iron ore, lime.

SHASTA

Land area: 3858 square miles.
Population: 13,925 (1930 census).
Location: North-central portion of state.
County seat: Redding.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XXII (April, 1926).

Shasta County stood twenty-second in California among the mineral producing counties for 1930, with an output valued at $1,111,146, as compared with the 1929 production worth $1,751,196.

The marked decrease since 1918 is due to the falling off in the output of copper, the large plants of the Mammoth and Mountain copper companies being shut down. Not taking petroleum into account, Shasta for a number of years led all of the counties by a wide margin, but in 1919–1923 was passed by San Bernardino, Plumas, Yuba, Inyo, Sacramento, Nevada, and Amador, among the 'metal' counties, though by only San Bernardino and Plumas of that group in 1925.

Shasta's mineral resources include asbestos, barytes, brick, chromite, coal, copper, gold, iron, lead, lime, limestone, mineral water, malybdenum, pyrites, silver, soapstone, miscellaneous stone, and zinc.

Lassen Peak is located in southeastern Shasta County.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	3,962,383 lbs.	$515,110
Gold	--------	226,214
Silver	14,135 fine oz.	5,442
Stone, miscellaneous	--------	228,778
Other minerals*	--------	135,602
Total value		$1,111,146

* Includes platinum and pyrite

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SIERRA

Land area: 923 square miles.
Population: 2419 (1930 census).
Location: Eastern border of state just north of Nevada County.
County seat: Downieville.
References: State Mineralogist Report XVI: XVII: XVIII: XX: XXV (April, 1929).

Sierra County reported a mineral production of $606,585 mainly of gold, during the year 1930, as compared with the 1930 output worth $390,402. Considering gold output this county stands fifth; and as to total mineral yield twenty-eight.

Aside from the metals itemized below, Sierra County contains deposits of asbestos, chromite, copper, iron, lead, platinum, serpentine, and talc.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Gold	----	$589,249
Silver	5,340 fine oz.	1,056
Stone, miscellaneous	----	15,265
Unapportioned	----	15
Total value		$606,585

SISKIYOU

Land area: 6256 square miles.
Population: 25,505 (1930 census).
Location: Extreme north-central portion of state, next to Oregon boundary.
County seat: Yreka.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXI (Oct., 1925): XXVIII (Jan., 1931).

Siskiyou, fifth county in California in regard to size, located in a highly mineralized and mountainous country, ranks forty-fourth in regard to the value of its mineral output for 1930.

Although this county is traversed by a transcontinental railroad in a north and south line, the mineral-bearing sections are almost without exception far from transportation and other facilities. A large part of the county is accessible by trail only. Future development and exploitation will increase the productiveness of this part of the state to a considerable extent.

Mount Shasta is located in Siskiyou County.

Among Siskiyou's mineral resources are chromite, clay, coal, copper, gems, gold, lead, limestone, manganese, marble, mineral water, pumice, quicksilver, sandstone, silver, and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	405,868 lbs.	$52,763
Gold	------	70,332
Lead	470 lbs.	24
Silver	10,836 fine oz.	4,173
Stone, miscellaneous	------	85,851
Other minerals*	------	22,258
Total value		$235,401

* Includes gems, granite, lime, mineral water, platinum, pumice, quicksilver.

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SOLANO

Land area: 822 square miles.
Population: 40,807 (1930 census).
Location: Touching San Francisco Bay on the northeast.
County seat: Fairfield.
References: State Mineralogist Report XIV: XVII: XVIII: XXIII (April, 1927).

Solano, while mostly valley land, produced mineral substances during the year 1930 to the total value of $46,638, ranking fifty-second among the counties of the state, an increase from the 1928 figure of $66,421.

Among her mineral resources are brick, cement, clay, fuller's earth, limestone, mineral water, natural gas, onyx, quicksilver, salt and miscellaneous stone.

Commercial production for 1930 was as follows:

Substance	*Value*
Unapportioned*	$46,638

* Includes onyx and travertine, quicksilver, miscellaneous stone.

SONOMA

Land area: 1577 square miles.
Population: 62,248 (1930 census).
Location: South of Mendocino County, bordering on the Pacific Ocean.
County seat: Santa Rosa.
References: State Mineralogist Report XIV: XVII: XVIII: XXII (July, 1926).

Sonoma ranked thirty-seventh among the counties of California during the year 1930, with a mineral production of $330,399, as compared with its 1929 output of $351,383. More paving blocks have been turned out here than in any other section of the state, but this industry has now ceased, owing to the construction of smooth-surface pavements, both in the cities and on the highways.

Among Sonoma's mineral resources are brick, chromite, clay, copper, graphite, infusorial earth, magnesite, manganese, marble, mineral paint, mineral water, quicksilver, and miscellaneous stone.

Commercial production for 1929 was as follows:

Substance	*Amount*	*Value*
Mineral water	17,900 gals.	$5,318
Stone, miscellaneous	-----	263,644
Other minerals*	-----	61,437
Total value		$330,399

* Includes quicksilver and 'sandstone.'

STANISLAUS

Land area: 1450 square miles.
Population: 56,624 (1930 census).
Location: Center of state, bounded on south by Merced County.
County seat: Modesto.
References: State Mineralogist Report XIV: XVII: XVIII: XXI (April, 1925).

Gold has usually been the chief mineral product of Stanislaus County, but it was exceeded in 1918–1919 by manganese, and in 1921–1923 and

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1925–1929 by miscellaneous stone. Brick, clay, gypsum, mineral paint quicksilver, and silver are found here to some extent as well. This county for 1930 ranks thirty-sixth in the state in regard to value of minerals, with an output of $331,688, as compared with $388,235 in 1929. Gold, platinum and silver are obtained mainly by dredging.

Commercial production for 1929 was as follows:

Substance	*Amount*	*Value*
Gold	---	$109,13
Lead	165 lbs.	
Silver	541 fine oz.	20
Stone, miscellaneous	---	180,37
Other minerals*	---	41,95
Total value		$331,68

* Includes clay (pottery), magnesite.

SUTTER

Land area: 608 square miles.
Population: 14,618 (1930 census).
Location: Bounded by Butte County on the north and Sacramento on the south.
County seat: Yuba City.
References: State Mineralogist Report XV: XVII: XVIII.

Sutter is one of only two counties in the state which for a number of years reported no commercial output of some kind of mineral substance. In 1917 some crushed rock was taken out, from the Marysville Buttes, also in 1925–1928.

There has been some utilization of natural gas. There was no mineral production reported in 1930. Both clay and coal exist here, but deposits of neither mineral have been placed on a productive basis.

TEHAMA

Land area: 2893 square miles.
Population: 13,839 (1930 census).
Location: North-central portion of the state, bounded on the north by Shasta.
County seat: Red Bluff.
References: State Mineralogist Report XV: XVII: XVIII: XIX: XXIV (July, 1928).

Tehama stands forty-fifth among the mineral producing counties of the state for 1930, when its output was valued at $226,400, as compared with the 1929 yield, worth $14,480.

Among its mineral resources are listed brick, chromite, copper, gold, manganese, marble, mineral water, salt, and miscellaneous stone.

The 1930 yield was distributed as follows:

Substance	*Value*
Stone, miscellaneous	$218,30
Other minerals*	8,10
Total value	$226,40

* Includes brick and sandstone.

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TRINITY

Land area: 3166 square miles.
Population: 2811 (1930 census).
Location: Northwestern portion of state.
County seat: Weaverville.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXII (Jan., 1926).

Trinity, like its neighbor, Siskiyou County, requires transportation facilities to further the development of its many and varied mineral resources. Deposits of asbestos, barytes, chromite, copper, gold, mineral water, platinum, quicksilver, silver, and building stone are known here, but with the exception of gold, chromite, copper, quicksilver and platinum, very little active production of these mineral substances has been made as yet.

The 1930 output of $437,333 shows a decrease from the 1929 figure of $525,874, due to gold, giving the county rank of thirty-third for the year.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	588,574 lbs.	$76,514
Gold	------	330,003
Silver	17,403 fine oz.	6,700
Stone, miscellaneous	------	4,238
Other minerals*	------	19,878
Total value		$437,333

* Includes coal, platinum and quicksilver.

TULARE

Land area: 4856 square miles.
Population: 77,375 (1930 census).
Location: Bounded by Inyo on the east, Kern on the south, Fresno on the north.
County seat: Visalia.
References: State Mineralogist Report XV: XVII: XVIII: XX.

Tulare stands forty-second on the list of mineral producing counties, the decrease from the 1930 value being due mainly to granite and miscellaneous stone.

This county's mineral resources, among others, are brick, clay, copper, feldspar, graphite, gems, limestone, magnesite, marble, quartz, glass-sand, soapstone, miscellaneous stone, and zinc. Tulare for a number of years led the state in magnesite output, except in 1918, when it was passed by Napa County, and since 1921 by Santa Clara.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Gold	---	$36
Silver	808 fine oz.	311
Stone, miscellaneous	---	74,500
Other minerals*	---	178,297
Total value		$253,144

* Includes gems, granite, limestone, magnesite, petroleum.

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TUOLUMNE

Land area: 2190 square miles.
Population: 9239 (1930 census).
Location: East-central portion of state—Mother Lode District.
County seat: Sonora.
References: State Mineralogist Report XIV: XVII: XVIII: XIX: XX: XXIV (Jan., 1928).

Tuolumne ranks thirty-ninth among counties of the state relative to its total value of mineral output for 1930. This county ranks first as a producer of marble in the state. The mineral production for 1930 was valued at $318,322 compared with $371,520 in 1929.

Chromite, clay, copper, gold, lead, limestone, marble, mineral paint, platinum, soapstone, silver, and miscellaneous stone are among its mineral resources.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Copper	4,566 lbs.	$593
Gold	----	67,691
Lead	317 lbs.	16
Silver	780 fine oz.	300
Other minerals*	----	249,722
Total value		$318,322

* Includes lime, limestone, marble, slate, miscellaneous stone.

VENTURA

Land area: 1878 square miles.
Population: 54,577 (1930 census).
Location: Southwestern portion of state, bordering on Pacific Ocean.
County seat: Ventura.
References: State Mineralogist Report XV: XVII: XVIII: XX: XXI (April, 1925).

Ventura is third county in the state in respect to the value of its mineral output for 1930. Its value passed that of Orange County, which for many years held this position. The 1930 mineral production was worth $31,952,052 as compared with the 1929 output worth $34,043,899, the decrease being due to petroleum.

Commercial production for 1930 was as follows:

Substance	*Amount*	*Value*
Gold	----------	$221
Natural gas	54,741,670 M cu. ft.	3,749,829
Petroleum	19,983,341 bbls.	27,896,744
Silver	5 fine oz.	2
Stone, miscellaneous	----------	180,322
Other minerals*	----------	124,934
Total value		$31,952,052

* Includes brick, clay (pottery), 'granite' (flagstone), limestone (shells).

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YOLO

Land area: 1017 square miles.
Population: 23,618 (1930 census).
Location: Sacramento Valley, bounded by Sutter on the east and Colusa on the north.
County seat: Woodland.
References: State Mineralogist Report XIV: XVII: XVIII.

The mineral production from Yolo County during the year 1930 consisted entirely of miscellaneous stone, valued at $2,700, ranking it in fifty-third place. Deposits of undetermined value of iron and sandstone have been discovered within the confines of this county. Quicksilver has also been produced.

YUBA

Land area: 639 square miles.
Population: 11,327 (1930 census).
Location: Lies west of Sierra and Nevada counties; south of Plumas.
County seat: Marysville.
References: State Mineralogist Report XV: XVII: XVIII: XX: XXVI (July, 1930).

Yuba is twenty-third of the mineral producing counties of the state, and has been first as a gold producer from 1925–1928, but was passed by Nevada, Amador, and Sacramento counties in the output of that metal in 1929. Iron and clay deposits have been reported in this county aside from the following commercial production shown for the year 1930. The decrease from the 1929 figure of $1,830,371 was due mainly to gold obtained by the dredgers (which also yield silver), to platinum and miscellaneous stone. The 1921 dredge yield of gold was a record for the county.

The 1930 production of Yuba County was distributed as follows:

Substance	*Amount*	*Value*
Gold	----	$968,814
Silver	3,260 fine oz.	1,255
Unapportioned	----	48,330
Total value		$1,018,399

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CHAPTER VIII

DIRECTORY OF PRODUCERS OF METALLIC AND NON-METALLIC MINERALS IN CALIFORNIA, 1930

Note—The producers of natural gas and petroleum will be found in the Quarterly Summary of Operations, California Oil Fields, for July, August and September, 1930 (Vol. 16, No. 1).

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ASBESTOS

Operator	Product	Address	Location of mine
Monterey County			
Burro Gorge Asbestos Mine, J. E. Barrett	a	1076 Pacific St., San Luis Obispo	Jolon
Riverside County			
Perris & Percival Deposits, Soto Battery Box Mfg. Co.	b	2457 Enterprise St., Los Angeles	Perris and Kenworth

a. Chrysotile. b. Amphibole.

BARYTES

Operator		Address	Location of mine
Inyo County			
Roy E. Newby[1]		3008 Asbury St., Los Angeles	Laws
Mariposa County			
National Pigments Co.		Russ Bldg., San Francisco	El Portal
Nevada County			
Democrat Barite Mine, Chemical & Pigment Co., Inc.		766 50th Ave., Oakland	Bear River
San Bernardino County			
Ellis Mallery		214 H. W. Hellman Bldg., Los Angeles	Barstow
Cooper Shapley		Bishop	Barstow
Santa Barbara County			
La Brea Barytes Co., Inc., Wm. E. Smith, Mgr.		449 Church St., Santa Maria	La Brea

[1] Taken over in 1931 by the Crucible Mining & Development Co. of Ventura.

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BITUMINOUS ROCK

Operator		Address	Location of quarry
Santa Barbara County			
Higgins Quarry, A. Sattler, lessee		Carpinteria	Carpinteria
Santa Cruz County			
Calrock Asphalt Co.		525 Market St., San Francisco	Majors

BORATES

Operator		Address	Location of plant
Inyo County			
Pacific Alkali Co.		1209 Pacific Mutual Bldg., Los Angeles	Bartlett
Kern County			
Pacific Coast Borax Co.		1014 Central Bldg., Los Angeles	Kramer
Suckow Borax Mines Consolidated, Inc., John K. Suckow		1283 Third Ave., Los Angeles	Muroc
Western Borax Co.		P. O. Box 37, Muroc	Muroc
San Bernardino County			
Amer. Potash and Chemical Corp.		Trona	Trona
West End Chemical Co.		Syndicate Bldg., Oakland	Searles Lake

BROMINE

Operator		Address	Location of plant
San Diego County			
California Chemical Corp.		111 Sutter St., San Francisco	San Diego

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CALCIUM CHLORIDE

Operator		Address	Location of plant
San Bernardino County			
California Rock Salt Co.		2465 Hunter St., Los Angeles	Amboy
Saline Products, Inc.		2000 Santa Fe Ave., Los Angeles	Amboy

CEMENT

Operator		Address	Location of plant
Calaveras County			
Calaveras Cement Co.		315 Montgomery St., San Francisco	San Andreas
Contra Costa County			
Henry Cowell Lime and Cement Co.		2 Market St., San Francisco	Cowell
Kern County			
Monolith Portland Cement Co.		Bartlett Bldg., Los Angeles	Monolith
Merced County			
Yosemite Portland Cement Co.		Merced	Merced
Riverside County			
Riverside Cement Co.		621 S. Hope St., Los Angeles	Riverside
San Benito County			
Pacific Portland Cement Co.		Hunter-Dulin Bldg., San Francisco	San Juan
San Bernardino County			
California Portland Cement Co.		1228 Pacific Mutual Bldg., Los Angeles	Colton
Southwestern Portland Cement Co.		605 H. W. Hellman Bldg., Los Angeles	Victorville
San Mateo County			
Pacific Portland Cement Co.		111 Sutter St., San Francisco	Redwood City
Santa Cruz County			
Santa Cruz Portland Cement Co.		Crocker Bldg., San Francisco	Davenport

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CHROMITE

Operator	Remarks	Address	Location of mine
Placer County			
Harry McCormick	o	Alta	Alta
Daniel Sullivan	o	Towle	Dutch Flat
J. L. Williams	s	Federal Telegraph Bldg., Oakland	Forest Hill
San Luis Obispo County			
P. A. H. Arata, Mutual Mine	s	San Luis Obispo	Goldtree
Shasta County			
Antone Orsini	o	Box 170, Redding	

o. Mined, but made no shipments. s. Both mined and shipped ore.

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CLAY

(Including producers of crude clay and manufacturers of brick, tile, porcelain, etc.)

Operator	Product	Address	Location of Plant
Alameda County			
California Faience Co.	a	1335 Hearst Ave., Berkeley	Berkeley
N. Clark & Sons	a, b, c	116 Natoma St., San Francisco	Oakland
Livermore Fire Brick Work and California Brick Plant, W. S. Dickey Clay Mfg. Co.	a, b, c	Rialto Bldg., San Francisco	Livermore and Fabrico
Electrical Porcelain Works	a	2416 6th St., Berkeley	Berkeley
A. K. Goodmundson	a	717 45th Ave., Oakland	Oakland
Interlocking Tile Co.	a, c	Niles	Niles
Kraftile Co., L. J. Layton	a	Niles	Niles
M. & S. Tile Co., Geo. A. Smith and J. M. Muneze	a, c	Decoto	Decoto
McNeal Clay Mine, C. B. Mally	c	Livermore	Tesla
Muresque Tiles, Inc.	a	503 Merchants Exchange Bldg., San Francisco	Oakland
Remillard Brick Co., R. C. Giroux, Secy.	b	332 Phelan Bldg., San Francisco	Pleasanton
Technical Porcelain and China Ware Co.	a	420 Kains Ave., Albany, via Berkeley, Cal.	Albany
Thomas Handmade Roofing Tile Co.	a, c	Decoto	Decoto
Western Clay Products (Formerly Calif. Pottery Co.)	a, c	2265 E. 12th St., Oakland	Niles
Emeryville Porcelain Works, Westinghouse Elec. and Mfg. Co.	a	East Pittsburgh, Pa.	Emeryville
Walrich Pottery	a	1285 Hearst Ave., Berkeley	Berkeley
Woolenius Tiles and Mantels	a	1315 2d St., Berkeley	Berkeley
Amador County			
M. J. Bacon	c	Ione	Carbondale
Carlyle Clay Deposits, E. E. Tremain	c	Buena Vista, via R. F. D., Ione	Buena Vista
N. Clark & Sons	c	116 Natoma St., San Francisco	Ione
Ione Clay Pit, W. S. Dickey Clay Mfg. Co.	c	Rialto Bldg., San Francisco	Ione
Ione Fire Brick Co., J. T. Roberts, Mgr.	b	1267 Russ Bldg., San Francisco	Ione
Ione Clay and Sand Co., Cal. Mineral Products Co.	c, f	Kohl Bldg., San Francisco	Ione
Newman Clay Co., Newman Estate	c	Ione	Ione
Preston School of Industry	b	Ione	Ione
Contra Costa County			
California Art Tile Co., J. W. Hislop, Mgr.	a	Box 1116, Richmond	Richmond
Clark Shale Deposit, N. Clark & Sons	c	116 Natoma St., San Francisco	Walnut Creek
Old Mission Tile Co.	a, c	1 20th St., Richmond	San Pablo
Port Costa Brick Works, C. G. Berg, Pres.	b	6th and Berry Sts., San Francisco	Port Costa

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Standard Sanitary Mfg. Co., F. A. Kales, Mgr.	a	Box W, Richmond	Richmond
United Materials & Richmond Brick Co., Ltd.	a, b	P. O. Box 7, Richmond	Richmond
Western Potters, Ltd.	a	136 Kearny St., El Cerrito	El Cerrito
Fresno County			
Craycroft Brick Co.	b	Griffith-McKenzie Bldg., Fresno	Fresno
Humboldt County			
J. D. Thompson Brick Co., J. D. Thompson, Mgr.	a, b, c	Box 16, Myrtle Ave., Eureka	Eureka
Inyo County			
California Desert Products Co.	g	58 Sutter St., San Francisco	Death Valley
Kern County			
Bakersfield Sandstone Brick Co., Jas. Curran, Mgr.	b	Bakersfield	Bakersfield
Bakersfield Rock & Gravel Co.	d	Box 395, Sta. A, Bakersfield	Bakersfield
King Lumber Co.	b	1402 King St., Bakersfield	Bakersfield
Muroc Clay Co.	e	5525 Randolph St., Maywood, Cal.	Muroc
Mojave Rotary Mud Co., Ltd.	d	Box 174, Los Nietos	Muroc
Owl Truck Co.	d	120 N. Tamarind, Compton	
Los Angeles County			
Alhambra Brick & Tile Co.	b, c	5547 Valley Blvd., Los Angeles	Los Angeles
Alhambra Kilns, Inc., W. Boswell	a	Alhambra	Alhambra and Santa Monica
American Refractories Co.	a, b	3232 Alosta St., Los Angeles	Los Angeles
Angulo Tile Plant, R. F. Angulo & Sons	a, c	Reseda	Reseda
Art Tile Co.	a	2304 E. 52d St., Los Angeles	Vernon
Batchelder-Wilson Tile Co.	a	2633 Artesian St., Los Angeles	Los Angeles
J. A. Bauer Pottery Co.	a	415 W. Ave., 33, Los Angeles	Los Angeles
Bay Cities Roofing Co., Inc.	a	1724 Stanford St., Santa Monica	Santa Monica
J. Booth	a	7578 Melrose, Los Angeles	Santa Monica
Builders Brick Co., Ltd.	b	177th and Western Ave's., Moneta	Moneta
Calco Tile Mfg. Corp.	a	South Gate	South Gate
California Clay Prod. Co., Ltd.	a, c	Box 568, Whittier	Whittier
California Brick & Tile Co.*	b	6151 Kester Ave., Van Nuys	Van Nuys
Claycroft Potteries, Fred H. Robertson	a	3101 San Fernando Blvd., Los Angeles	Los Angeles
Compton Brick and Tile Co.	b	402 Pacific S. W. Bldg., Long Beach	Compton
Consolidated Brick & Tile Co., Ltd.	a, b, c	306 Architects Bldg., Los Angeles	Los Angeles, Long Beach and Santa Monica
Cooks Co., H. F. Inc.	a	Inglewood	Inglewood

a. Clay products. b. Brick and hollow building tile. c. Crude clay. d. Oil well drilling mud. e. Filtering clay. f. Fire sand. g. Bentonite for filler in water ditches. h. Earth. * Combined to form the Consolidated Brick & Tile Co., Ltd.

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CLAY—Continued

(Including producers of crude clay and manufacturers of brick, tile, porcelain, etc.)

Operator	Product	Address	Location of plant
Los Angeles County—Continued			
Davidson Brick Co.	b, c	4701 Floral Dr., Los Angeles	Los Angeles
N. B. Demopoulis	a	1218 Subway Terminal Bldg., Los Angeles	Vernon
Eljer California Co.	a	4100 Alameda, Los Angeles	Arcadia
Empire China Co.	a	Burbank	Burbank
Emsco Refractories Co.	b, c	8661 Dorothy Ave., South Gate	South Gate
Tropico, L. A. & S. M. Plants, Gladding McBean & Co.*	a, b, c	660 Market St., San Francisco	Tropico, Los Angeles and Santa Monica
Higgins Brick & Tile Works, James R. Higgins	a, b, c	155 E. 121st St., Los Angeles	Moneta
Hispano-Moresque Tile Co.	a	3d and Rushton Sts., Lawndale	Lawndale
Italian Terra Cotta Co.	a	1149 Mission Rd., Los Angeles	Los Angeles
K. & K. Geo. H. Snyder, Pres.	b	730 C. C. Chapman Bldg., Los Angeles	Bishop Canyon
K & M Pottery Co.	a	2318 E. 52d St., Los Angeles	Los Angeles
Long Beach Brick Co., Inc., H. A. Havner, Mgr.	b	154 Elm Ave., Long Beach	Long Beach
Los Angeles Brick Co.	b	1078 Mission Rd., Los Angeles	Los Angeles
Madre Tile Co.	a	6730 Van Alden, Reseda	Reseda
Malibu Potteries	a, c	P. O. Box 518, Santa Monica	Santa Monica
Markoff Mosaic Tile Corp.	a	1107 E. Redondo Blvd., Inglewood	Inglewood
Pacific Clay Products	a, b, c	650 Chamber of Comm. Bldg., Los Angeles	Los Angeles and Los Nietos
Pomona Brick Co., Wm. McMullen, Mgr.	b	Pomona	Pomona
Pomona Tile Mfg. Co.	a	Pomona	Pomona
San Valle Tile Kilns, R. F. Stubver, Mgr.	a, c	6601 Wilbur, Reseda	Reseda
Santa Catalina Island Co., Wm. Wrigley, Jr.	a, b, c	Avalon	Santa Catalina Island
Santa Monica Brick Co.*	a, b	816W. 5th, Los Angeles	Santa Monica
St. Louis Fire Brick and Clay, Joseph Mesmer	a, b	3050 E. Slauson St., Los Angeles	Los Angeles
Simons Brick Co., Walter R., Simons	a, b, c	1195 S. Boyle Ave. Los Angeles	Los Angeles
Standard Brick Co.	b	580 Chamber of Commerce, Los Angeles	Los Angeles
Tillotson Clay Products	a, b	3363 Fruitland Rd., Vernon	Vernon
Torrance Brick Co.	b	Border St., Torrance	Torrance
Tudor Potteries	a	2406 E. 58th St., Los Angeles	Los Angeles
Vernon Potteries	a	2300 E. 52d St., Los Angeles	Vernon
Vitrefrax Company	b	5100 Pacific Ave., Los Angeles	Vernon
West Coast Tile Manufacturers	a, c	3515 W. Pico St., Los Angeles	Huntington Park
Western Brick Co.*	a, b, c	586 Chamber of Commerce Bldg., Los Angeles	Santa Monica
Western Standard Tiling Co.	a	1461 Lincoln St., Hollydale	Hollydale

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Tillotson Clay Products	a, b	[illegible]	[illegible]
Torrance Brick Co.	[illegible]	[illegible]	[illegible]
Marin County			
McNear Brick Co.	b	946 Monadnock Bldg., San Francisco	McNear
Mendocino County			
W. N. Briggs	b	Ukiah	Ukiah
Merced County			
Merced Clay Products Co., Ltd., V. H. Martin, Mgr.	a, b, c	Merced	Merced
Monterey County			
Salinas Valley Clay Prod. Co.	a, c	Castroville	Castroville
Orange County			
American Fire Clay Co.	c	5050 Pacific Blvd., Vernon	San Juan
Arnold Clay Mine, I. P. Arnold	c	El Toro	El Toro
Emsco Clay Co.	c	5601 S. Boyle Ave., Vernon	
Gladding, McBean & Co.	c	660 Market St., San Francisco	
La Bolsa Tile Co., A. N. Griffith	a, b, c	Rt. 1, Box 174, Huntington Beach	Smeltzer
Mission Clay Products Co.	a, c	Olive	Olive
Pacific Clay Products	c	650 Chamber of Commerce Bldg., Los Angeles	
Placer County			
Clay Corp. of Cal.	c	1267 Russ Bldg., San Francisco	Lincoln
Gladding, McBean & Co.	a, b, c	5th floor, 660 Market St., San Francisco	Lincoln
Lincoln Clay Products Co., M. J. Dillman, Mgr.	c	Lincoln	Lincoln
Riverside County			
Alberhill Coal and Clay Co., Geo. C. Hill	c	Alberhill	Alberhill
Emsco Clay Co.	c	5701 S. Boyle Ave., Vernon	Corona
Gladding, McBean & Co.	a, b, c	660 Market St., San Francisco	Alberhill
La Olla Tile Co.	a, c	405 W. 6th St., Corona	Prado
Los Angeles Brick Co.	a, b, c	1078 Mission Rd., Los Angeles	Alberhill
Geo. H. Morton	c	Elsinore	Elsinore
Pacific Clay Products	c	650 Chamber of Commerce Bldg., Los Angeles	Corona
H. Pate	a, c	Corona	Prado
Sacramento County			
Cannon & Co.	b	Box 281, Sacramento	Ben Ali
Grover Russi Clay Pit, Gladding, McBean & Co.	c	660 Market St., San Francisco	White Rock
H. C. Muddox	a, b	30th and L Sts., Sacramento	Sacramento
Panama Pottery Co.	a	Box 1478, R.F.D. No. 4, 24th St. Rd., Sacramento	Sacramento
Sacramento Brick Co.	b	1400 Front St., Sacramento	Sacramento
Valley Brick Co.	b	P. O. Box 1180, Sacramento	Sacramento

a. Clay products. b. Brick and hollow building tile. c. Crude clay. * Combined to form the Consolidated Brick & Tile Co., Ltd.

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CLAY—Continued

(Including producers of crude clay and manufacturers of brick, tile, porcelain, etc.)

Operator	Product	Address	Location of plant
San Bernardino County			
California Talc Co.	c, e	837 Jackson St., Los Angeles	Hector
A. B. Clark	c	1211 Sun Finance Bldg., Los Angeles	Oro Grande
Hancocks Brick Yard, C. P. Hancock & Son	a, b, c	4330 Lemon St., Riverside	Highgrove
Kennedy Clay Pit, John Kennedy	c	Daggett	Daggett
Standard Sanitary Mfg. Co., Pacific Mines, F. A. Kales, Mgr.	c	P. O. Box W, Richmond	Hart
J. W. Wood	e	247 Prospect Ave., San Bernardino	Barstow
San Diego County			
American Encaustic T. Co.	a, c	52d and Alameda Sts., Los Angeles	El Cajon
Mosto Otaylite Deposit, General Petroleum Corp.	e	1003 Higgins Bldg., Los Angeles	Otay
Pacific Clay Products Co.	c	650 Chamber of Commerce Bldg., Los Angeles	Farr Station
Standard Oil of California	e	Standard Oil Bldg., San Francisco	Palm Siding
Union Brick Co., J. W. Rice	b	3565 3d St., San Diego	Rose Canyon
Vitrified Products Corp.	a, b, c	2841 Jefferson St., North San Diego	North San Diego
San Francisco County			
Jalanivich & Olsen	a	2930 Baker St., San Francisco	San Francisco
San Joaquin County			
San Joaquin Brick Co., J. F. Stein Secy.	b	33 S. El Dorado St., Stockton	Stockton
Stockton Brick and Tile Co.	b	McKinley Ave., Stockton	Stockton
Stockton Fire Brick Co., John T. Roberts, Mgr.	b	Stockton	Stockton
Stockton Pottery Co.	a	600 E. Main St., Stockton	Stockton
San Luis Obispo County			
San Luis Brick Works, Faulstick Bros.	b	San Luis Obispo	San Luis Obispo
San Mateo County			
Richmond Potterys, Inc.	a	Box 187, South San Francisco	South San Francisco
West Coast Porcelain Co.	a	P. O. Box 46, Millbrae	Millbrae
Santa Barbara County			
Associated Clay Products, Elmer H. Whittaker, owner	a, b	124 E. Arrillaga St., Santa Barbara	Santa Barbara
Carpinteria Brick & Tile Co.	a, b	Box 332, Carpinteria	Carpinteria
Gamble Brick Co., E. T. Gamble	a, b	Santa Maria	Santa Maria

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Richmond Potteries, Inc. West Coast Porcelain Co.	a	Box 187, South San Francisco P. O. Box 18, Millbrae	South San Francisco Millbrae
Santa Clara County			
Carroll Gravel Pit, R. D. Carroll	c	950 6th St., San Jose	San Jose
Coyote Creek Clay Beds, L. R. Lenfect	c	1195 E. Santa Clara St., San Jose	San Jose
Garden City Pottery, N. J. Mahone	a	560 N. 6th St., San Jose	San Jose
Gladding Bros. Mfg. Co.	a, b	South 3d and Keys Sts., San Jose	San Jose
Handcraft Tile Co., L. W. Austin et al	a	Route 2, Box 121A, San Jose	San Jose
James A. Le Mieux	c	Box 341, Senter Rd., San Jose	San Jose
Geo. J. Poxon	a	P. O. Box 327, Santa Clara	Santa Clara
Remillard Brick Co.	b	332 Phelan Bldg., San Francisco	San Jose
San Jose Brick Co.	b, c	P. O. Box 274, San Jose	San Jose
S & S Tile Co.	a	1881 S. First St., San Jose	San Jose
Stanislaus County			
Coopertown Clay Deposit, J. H. Hornsby	a	19 W. 6th St., Stockton	Coopertown
Tulare County			
S. P. Brick and Tile Co., W. D. Trewhitt, Mgr.	b	1561 Pacific Southwest Bldg., Fresno	Exeter
Ventura County			
Anderson & Hardison Press Brick Co., J. C. Hardison and G. A. Anderson	b, c	Santa Paula	Santa Paula
Peoples Lumber Co., C. E. Bonestel, Mgr.	b, c	708 E. Meta St., Ventura	Ventura
Dent Clay Pit Shell Oil Co.	d	Shell Bldg., San Francisco	Ventura

a. Clay products. b. Brick and hollow building tile. c. Crude clay. d. Oil well drilling mud. e. Filtering clay.

COAL

Operator		Address	Location of mine
Amador County			
Buena Vista Coal Mfg. Co., J. J. Morras, Supt.		Ione, c/o R.F.D.	Buena Vista
Monterey County			
Atlas Smelting and Refining Co., V. M. Price		Wells Fargo Bldg., San Francisco	Stone Canyon
Trinity County			
Big Bar Coal Mining Co., E. O. E. Klipphahn, Secy.		Route 1, Box 92A, Grass Valley	Big Bar

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COPPER

Principal Copper Producers in California in 1929

Mine	Operator	Address	Location of mine
Alameda County			
Leona Heights and Alma	Blowski Copper Co.	1328 Trestle Glen Rd., Oakland	Oakland
Calaveras County			
Calaveras	Engels Copper Co.	Mills Bldg., San Francisco	Copperopolis
Penn	Mateo Mining Co., R. C. Lane, Secy.	P. O. Box "O," San Mateo	Campo Seco
Nevada County			
Murchie	American Foundation Co.	P. O. Box 687, Nevada City	Nevada City
Plumas County			
Engels	Engels Copper Mining Co.	Mills Bldg., San Francisco	Engelmine
Walker	Walker Mining Co.	Kearns Bldg., Salt Lake City, Utah	Walkermine
San Bernardino County			
Anchor	New Trail Mining Co., J. F. Kent, Pres.	Box 876, Riverside	Cima
Shasta County			
Greenhorn	Greenhorn Mining Co., Albert Hanford	Golden Eagle Hotel, Redding	French Gulch
Hornet	Mountain Copper Co., Ltd., W. S. Howard	112 Market St., San Francisco	Matheson
Siskiyou County			
Blue Ledge	Consolidated Copper Mining Co.	P. O. Box 149, Tacoma, Wash.	P. O., Copper, Oregon
Trinity County			
Island Mountain	Island Copper Co., E. R. Leach, Mgr.	715 Easton Bldg., Oakland	Island Mountain

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DIATOMACEOUS EARTH

Operator		Address	Location of quarry
Fresno County			
Mineral Products Mfg. Co., T. H. Eliatt and L. J. Allen		3464 Ventura St., Fresno	Mendota
Los Angeles County			
The Dicalite Co.		756 S. Broadway, Los Angeles	San Pedro
Monterey County			
Calatome Co., R. B. Hoffman et al		Monterey	Monterey
Pacatome Co.		Kohl Bldg., California and Montgomery Sts., San Francisco	Bradley
Santa Barbara County			
Celite Corp.		Lompoc	Lompoc
The National Silica Producers		63 Bluxome St., San Francisco	Lompoc

DOLOMITE

Operator		Address	Location of quarry
Inyo County			
Inyo Marble Co.		361 N. Avenue 22, Los Angeles	Lone Pine
Monterey County			
Pacific Coast Steel Corp., Sterling Ranch Dolomite Quarry		Bethlehem, Pa.	Natividad

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FELDSPAR

Operator		Address	Location of mine
Kern County			
N. W. Sweetser		4235 Monroe St., Los Angeles	Rosamond
Riverside County			
American Encaustic Tiling Co.		52d and Alameda Sts., Los Angeles	
Perris Mining Co., James D. Gray and C. E. Woodruff		350 Wisconsin Ave., Long Beach	Winchester
Arthur L. Taber		208 E. 6th St., Corona	Corona
San Diego County			
Standard Sanitary Mfg. Co., Pacific Mines, F. A. Kales, Mgr.		P. O. Box W, Richmond	Campo

FULLER'S EARTH

Operator		Address	Location of pit
Kern County			
Muroc Clay Co.		5525 Randolph St., Maywood	Muroc
San Bernardino County			
California Talc Co.		837 Jackson St., Los Angeles	Hector
J. W. Wood		247 Prospect Ave., San Bernardino	Barstow
San Diego County			
Mosto Otaylite Deposit, General Petroleum Corp. of Cal.		1003 Higgins Bldg., Los Angeles	Otay
Standard Oil Co. of California		Standard Oil Bldg., San Francisco	Palm Siding

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GEMS

Operator	Variety	Address	Location of mine
Butte County			
Wm. Fliedner	Diamond	Route 1, Oroville	Cherokee
Calaveras County			
Green Mountain Mine, J. J. McSorley, Mgr.	Quartz crystals	Mokelumne Hill	Mokelumne Hill
Inyo County			
Rocky Mountain George	Cyanite and chiastolite	Beatty, Nevada	
Kern County			
Pacific Minerals Association, John W. Hilton	Rose quartz	1024 7th St., Hermosa Beach	
San Bernardino County			
Carl L. Hilton	Iceland spar	Route 10, Box 4340E, Sacramento	
Pacific Minerals Association, John W. Hilton	Blue agate and bloodstone	1024 7th St., Hermosa Beach	Death Valley
San Diego County			
Pala Chief Mine, Frank A. Salmons, Owner	Kunzite and tourmaline	John D. Spreckels Bldg., San Diego	Pala
Siskiyou County			
Geo. A. Greive	Agate	Hornbrook	Agate Flat
Tulare County			
Janoiko Bros.	Chrysopase	R.F.D. 1, Box 688, Porterville	Porterville

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GOLD

Principal Gold Producers in California out of a Total of 1372 Operators of Placer and Lode Mines in 1930

Mine	Type of mine	Operator	Address	Location of mine
Amador County				
Amador Queen	a	Garibaldi and Sanguinetti	Jackson	Jackson
Argonaut	a	Argonaut Mining Co.	Humboldt Bank Bldg., San Francisco	Jackson
Central Eureka	a	Central Eureka Mg. Co.	Hunter-Dulin Bldg., San Francisco	Sutter Creek
Fuller Property	a	Bornich and Zumwalt	Jackson	Jackson
Kennedy	a	Kennedy Mng. & Mg. Co.	519 California St., San Francisco	Martell
Lancha Plana	e	Lancha Plana Gold Dredging Co.	Comanche	Comanche
Butte County				
Shasta-Butte	e	Shasta-Butte Gold Dredging Co.	Oroville	Oroville
Calaveras County				
Calaveras	a	Mar-John Mines Co.	342 5th St., San Francisco	Sheepranch
Lamphear	a	Mother Lode Central Gold Mining Co.	948 Market St., San Francisco	Mokelumne Hill
McCarthy Ranch	a	Ranch Mining Co.	Milton	Milton
Milton	e	Milton Mining Co.	Turlock	Milton
Oro y Plata	a	Union Cons. Mining Co.	Alexander Bldg., San Francisco	Murphy
El Dorado County				
Kelsey	a	Kelsey Mining Co.	931 Market St., San Francisco	Placerville
Middle End	a	Florian Sciaroni	Grizzly Flats	Grizzly Flats
Pocket Claim	d	George Swift	Georgetown	Georgetown
Slate Mountain	a	R. W. Brooke	Box 222, Placerville	Placerville
Sliger	a	Sliger Gold Mining Co.	Greenwood	Greenwood
Van Hooker	a	Placerville Gold Mng. Co.	Box 512, Placerville	Placerville
Fresno County				
Service Rock Pit	b	Grant Service Rock Co. Cons.	Fresno	Fresno
Inyo County				
Radcliff	a	W. D. Clair and Sons	208 N. Union Ave., Los Angeles	Trona
Kern County				
Keyes	a	Minaret Cons. Mining Co.	A. G. Bartlett Bldg., Los Angeles	Isabella
Tropico	a	Tropico Mng. & Mg. Co.	Rosamond	Rosamond
Yellow Aster	a	Yellow Aster Mng. & Mg. Co.	Randsburg	Randsburg

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Mariposa County				
Feliciana	a	Feliciana Gold Mining Co.	Phelan Bldg., San Francisco	Mariposa
Original	a	Original Mng. & Mg. Co.	Mariposa	Clearinghouse
Spread Eagle	a	Whitlock Mines Corp.	141 Milk St., Boston, Mass.	Mariposa
Merced County				
Merced River	e	La Grange Gold Dredging Co.	La Grange	La Grange
Mono County				
Red Cloud	a	Treadwell Yukon Co., Ltd.	Crocker Pldg., San Francisco	Bodie
Standard Dump	c	Clinton West Co.	1061 Market St., San Francisco	Bodie
Napa County				
Palisades	a	Banner Dev. Co., Lloyd Root	57 Post St., San Francisco	Calistoga
Nevada County				
Boundary	a	Wm. J. Condon	De Young Bldg., San Francisco	Grass Valley
Empire and North Star	a	Empire-Star Mines Co., Ltd.	Mills Bldg., San Francisco	Grass Valley
Hoge	a	Hoge Development Co.	509 Pine St., Nevada City	Nevada City
Idaho Maryland	a	Idaho Maryland Mine Co.	Hobart Bldg., San Francisco	Grass Valley
Murchie	a	American Foundation Co.	P. O. Box 687, Nevada City	Nevada City
Omega Hill	g	Omega Hill Mining Co.	35 Cooper Ave., Yuba City	Washington
Queen Lil	a	Gordon M. Bettles	Nevada City	Nevada City
Walcott	a	J. Delgrosso	Nevada City	Nevada City
Plumas County				
Brown Bear	f	John Pecard	540 Jones St., San Francisco	Quincy
Engels	a	Engels Copper Mining Co.	Mills Bldg., San Francisco	Engelmine
Marguerita	f	La Porte Mines, Inc.	530 W. 6th St., Los Angeles	La Porte
Rush Creek, Placer	b	Mrs. Maxwell & Sons	La Porte	La Porte
Standart	a	Yakima Mohawk Mining Co., c/o John Sawbridge	Yakima, Wash.	Greenville
Walker	a	Walker Mining Co.	Kerns Bldg., Salt Lake City, Utah	Walkermine
Sacramento County				
Capital	e	Capital Drdg. Co	Balfour Bldg , San Francisco	Folsom
Natomas	e	Natomas Co.	Forum Bldg., Sacramento	Natomas
San Bernardino County				
Uranium Group	a	Wortley Cons. Mines, Inc.	Red Mountain	Randsburg
Vanderbilt	a	Vanderbilt Mines Co.	I. W. Hellman Bldg., Los Angeles	Ivanpah
Shasta County				
Hornet	a	The Mountain Copper Co., Ltd.	112 Market St., San Francisco	Matheson
Shasta-Butte	e	Shasta-Butte Gold Drdg. Co.	Oroville	Redding

a. Lode mine. b. Placer mine. c. Dump. d. Pocket mine. e. Dredge. f. Drift mine. g. Hydraulic mining.

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GOLD—Continued

Principal Gold Producers in California Out of a Total of 1372 Operators of Placer and Lode Mines in 1930

Mine	Type of mine	Operator	Address	Location of mine
Sierra County				
Brush Creek	a	Kate Hardy Mng. Co., Ben F. Ballard	754 State St., Santa Rosa	Goodyear's Bar
Depot Hill	g	F. J. Joubert	Camptonville	Camptonville
Kirkpatrick	b	Kirkpatrick Mines Co.	2208 N St., Sacramento	Goodyear Bar
Original 16 to 1	a	Original 16 to 1, Inc.	607 Monadnock Bldg., San Francisco	Alleghany
Oro Flame & Bonanza King	a	John J. Cannell	Alleghany	Alleghany
Sacred Mound	a	Butte Saddle Mining Co.	Guaranty Bldg., Hollywood	Sierra City
Siskiyou County				
Buzzard Hill and Independence	a	Buzzard Hill Mine, Inc.	Happy Camp	Happy Camp
Blue Ledge	a	Consolidated Copper Mining Co.	P. O. Box 149, Tacoma, Wash.	Copper Ore
Schroeder	a	Fidelity Metals Corp.	903 Pine St., San Francisco	Fort Jones
Tony Lund	b	H. C. Benson Co.	American Bank Bldg., Portland, Ore.	Hornbrook
Stanislaus County				
La Grange	e	La Grange Gold Dredging Co.	La Grange	La Grange
Trinity County				
Enterprise	a	W. R. Bigelow	Weaverville	Helena
Island Mountain	a	Island Copper Co., E. R. Leach, Mgr.	715 Easton Bldg., Oakland	Island Mountain
Lewiston	e	Placer Development, Ltd.	58 Sutter St., San Francisco	Lewistown
Madrona	e	Madrona Dredging Co.	Junction City	Junction City
North Fork	g	North Fork Placer	519 Clement Dr., Glendale	Helena
Paymaster	a	Grant D. Miller	2372 E. 14th St., Oakland	Lewistown
Redding Creek	g	Redding Creek Placers, Ltd.	Douglas City	Douglas City
Trinity	e	Trinity Dredging Co.	Lewiston	Lewiston
Tuolumne County				
Fifty-five	a	Mother Lode Extension Mines, Inc.	2323 W. 6th St., Los Angeles	Merced Falls
Lazar	d	Vucasovich Co.	Sonora	Sonora
Ratto Ranch	d	Frank T. Moyle	Sonora	Jamestown
Sugarman-Niger	a	Sugarman Mines, Inc.	533 Roosevelt Bldg., Los Angeles	Sonora
Yuba County				
Gorden Valley	e	Horace M. Onyett	Log Cabin	Camptonville
Red Cross	a	Red Cross Mining Co.	620½ I St., Sacramento	Dobbins
Yuba	e	Yuba Consl. Gold Field, Hammon Eng. Co.	351 California St., San Francisco	Hammonton

a, Lode mine; b, Placer mine; d, Pocket mine; e, Dredge; f, Drift mine; g, Hydraulic mining.

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GRANITE

Operator	Product	Address	Location of quarry
Fresno County			
Academy Granite	a	Clovis	Clovis
Superior Granite Co., Inc.	a	Clovis	Academy
Inyo County			
Bly Stone Co. (tuff)	b	1985 E. 16th St., Los Angeles	Round Valley
Lassen County			
Grieg Quarry, A. D. Grieg	a	Susanville	Susanville
Los Angeles County			
Desert Stone Co., H. A. Jones	c	295 Grant St., Pasadena	
Madera County			
McGilvray-Raymond Corp.	a	3 Potrero Ave., San Francisco	Raymond
Mariposa County			
Yosemite National Park	a	Yosemite	Yosemite Park
Placer County			
Alexson Granite Co.	a	Rocklin	Rocklin
A. Pernu Granite Quarries, Adolph Pernu	a	Rocklin	Rocklin
Rocklin Granite Co., H. Grindell	a	Rocklin	Rocklin
Union Granite Co., Mat Ruhkala	a	Rocklin	Rocklin
Plumas County			
Paul Sonognini	a	Chilcoot	Chilcoot
Riverside County			
N. B. Walters Quarry, N. B. Walters	a	28 Chapel St., Alhambra	Val Verde
Sacramento County			
Folsom State Prison	a	Represa	Represa

a. Granite used in building and monumental stone. b. Tuff used as building stone. c. Granitic rock used as flagstone.

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GRANITE—Continued

Operator	Product	Address	Location of quarry
San Diego County			
American Marble & Granite Works	a	1212 E. 19th St., Los Angeles	Santee
Crystal Black Quarry, John Stridsburg	a	Escondido	Spooks Canyon
McGilvray-Raymond Corp., Lakeside Quarry	a	6782 S. Anderson St., Los Angeles	Lakeside
Mission Silver-Gray Granite	a	3422 Union Pacific Ave., Los Angeles	Lakeside
Meyer Granite Quarry, W. A. Meyer	a	Lakeside	Lakeside
Simpson-Pirnie Granite Co.	a	21st and N Sts., San Diego	Santee
Southern Cal. Granite Co.	a	3845 Imperial St., San Diego	Lakeside
San Luis Obispo County			
Fabbris-Carpentier Co.	c	275 Bush St., San Francisco	Acascadine
Tulare County			
California Quarry, McGilvray-Raymond Corp.	a	3 Potrero Ave., San Francisco	Porterville
Ventura County			
G. W. Dryden	c	Fillmore	Grimes Canyon
Ritchie Bros., R. A. and J. A. Ritchie	c	Fillmore	Grimes Canyon
Siskiyou County			
Oberlin Hill Quarry, J. B. Russell	a	Box 344, Yreka	Yreka

a. Granite used in building and monumental stone. c. Granitic rock used as flagstone.

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GYPSUM

Operator	Address	Location of quarry
Fresno County		
Mineral Products Mfg. Co., T. H. Elliett, Pres.	3464 Ventura St., Fresno	
Paoli Gypsum Mine, A. P. Shepard	3101 Mariposa St., Fresno	Mendota
Imperial County		
Imperial Gypsum Quarry, Pac. Portland Cement	111 Sutter St., San Francisco	Plaster City
Kern County		
Koehn Gypsum Mine, Jennie E. Koehn	Saltdale	Saltdale
Riverside County		
E. R. Nonhoff	1116 Ramona St., Corona	Corona
U. S. Gypsum Co.	507 Architects Bldg., Los Angeles	Midland

IRON ORE

Operator	Address	Location of mine
Santa Cruz County		
Commercial Alloys Corp., Paul E. Terry, Secy.	625 Market St., San Francisco	Santa Cruz

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LEAD

Mine	Operator	Address	Location of mine
Inyo County			
All American	All American Mining Co.	Zabriskie via Tecopa	Keeler
Brown	Chas. Brown	Shoshone	Shoshone
Butte	Montana-Tonopah Co. (Reorg.)	Beatty, Nev.	Ubehebe
Carbonate	Helene M. Salsberry, Lessee	2250 Green St., San Francisco	Zabriskie
Estelle and Cerro Gordo	American Smelting & Refining Co.	McCormick Bldg., Salt Lake, Utah	Keeler
Lead Lode	J. W. Ehrman	c/o Josephs Store, Big Pine	Zurich
Moonday	Tecopa Cons. Mining Co.	Tecopa	Tecopa
Ophir	Engineers Exploration Co.	702 California Reserve Bldg., Los Angeles	Trona
Santa Rosa	Santa Rosa Mining Co.	Tonopah, Nev.	Keeler
Nevada County			
Murchie	American Foundation Co.	P. O. Box 687, Nevada City	Nevada City
San Bernardino County			
Burchan	J. F. Horan	891 5th Ave., Los Angeles	Daggett
Everett & Evalyn	E. Meyers & J. P. Johnson	Cajon	Ludlow

LIME AND LIMESTONE

Operator	Product	Address	Location of quarry
El Dorado County			
Diamond Springs Lime Co.	a, b	Diamond Springs	Diamond Springs
El Dorado Limestone Co., J. H. Bell, Receiver	b	Shingle Springs	Shingle Springs
Pac. Portland Cement Co. Cons.	b	111 Sutter St., San Francisco	Auburn
Inyo County			
Inyo Chemical Co.	a	Cartago	Cartago
Mendocino County			
Northwest Pacific Lime & Sulphur Co.	a	115 S. Main St., Sebastopol	Laughlin

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San Benito County		
San Benito Lime Kilns, A. E. Hamilton	a	Western Hotel, Hollister — Cienega
San Bernardino County		
Cal. Portland Cement Co.	a	1228 Pac. Mutual Bldg., Los Angeles — Colton
Chas. D. Chubbuck	b	5000 Worth St., Los Angeles — Ludlow
Victorville Lime Rock Co.	b	2149 Bay St., Los Angeles — Victorville
San Mateo County		
Pacific Portland Cement Co.	c, d	111 Sutter St., San Francisco — San Mateo
Santa Clara County		
Bay Shell Co.	c, d	519 California St., San Francisco — Alviso
W. B. Ortley Shell Co.	d	Alviso — Alviso
Santa Cruz County		
Henry Cowell Lime and Cement Co., W. H. George, Mgr.	a	2 Market St., San Francisco — Santa Cruz
Holmes Lime & Cement Co.	a	Division and De Haro Sts., San Francisco — Felton
Pacific Limestone Prod. Co.	b	Spring St., Santa Cruz — Santa Cruz
Santa Cruz Port. Cement Co.	b	Crocker Bldg., San Francisco — Davenport
Siskiyou County		
Mt. Shasta Lime Co., W. J. Chastain	a	Gazelle — Gazelle
Tulare County		
Kaweah Quarries, A. C. Root, Owner	b	Lemoncove — Lemoncove
Valley Lime Co., E. H. McEuen	b	118 W. Honolulu St., Lindsay — Lindsay
Tuolumne County		
U. S. Lime Products Corp.	a, b	58 Sutter St., San Francisco — Sonora
Ventura County		
Papa Alta Lime & Fertilizer Co., Mrs. M. L. Franklin, Secy.	d	4336 Victoria Park Dr., Los Angeles — Santa Susana

a. Producer of burnt lime. b. Producer of limestone. c. Agricultural lime. d. Shells.

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MAGNESITE

Operator	Address	Location of mine
San Benito County		
Sampson Magnesite Co.	803 Balfour Bldg., San Francisco	Sampson Park
Santa Clara County		
C. S. Maltby Magnesite Co., Ltd., Western Magnesite Mine	1006 Humboldt Bank Bldg., San Francisco	Red Mountain
Stanislaus County		
California Magnesite Co.	1215 First National Bank Bldg., San Francisco	Red Mountain
Sierra Magnesite Co., Bald Eagle Mine	111 Sutter St., San Francisco	Gustine
Tulare County		
Sierra Magnesite Co.	111 Sutter St., San Francisco	Porterville

MAGNESIUM SALTS

Operator	Product	Address	Location of plant
San Diego County			
California Chemical Corp.	Chloride	111 Sutter St., San Francisco	San Diego
San Mateo County			
Marine Chemical Co., R. E. Clarke	Carbonate	South San Francisco	South San Francisco

MANGANESE ORE

Operator	Address	Location of mine
Plumas County		
Feather River Mine, J. A. Levensaler	114 Sansome St., San Francisco	Crescent Mills
San Bernardino County		
Owl Holes Mine, J. W. Wood	247 Prospect Ave., San Bernardino	Silver Lake

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MARBLE (Including Onyx and Travertine)

Operator	Product	Address	Location of quarry
Amador County			
California Carrara Marble, A. G. Dondero	a	2895 3d St., San Francisco	Pine Grove
Inyo County			
Inyo Marble Co.	a	361 N. Avenue 22, Los Angeles	Lone Pine
San Luis Obispo County			
F. H. Warde	b	118 State St., Santa Barbara	Santa Rita Grade
Santa Barbara County			
G. Antolini	b	111 E. Gutierrez St., Santa Barbara	Tajiguas
Solano County			
P. Grassi & Co.	c	1945 San Bruno Ave., San Francisco	Tolenas Springs
Tolenas Springs Onyx, L. Cardini	c	121 14th St., San Francisco	Tolenas Springs
Tuolumne County			
The Columbia Marble Co., R. H. Van Norden, Secy.	a	413 Rialto Bldg., San Francisco	Columbia

a. Marble. b. Limestone flagstone. c. Onyx and travertine.

MINERAL PAINT

Operator	Address	Location of mine
Placer County		
J. L. Williams	4 Federal Telegraph Bldg., Oakland	Forest Hill

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MINERAL WATER

Operator		Address	Location of spring
Butte County			
Richardson Springs, Lee Richardson, Mgr.		Chico	Chico
Calaveras County			
Mok-Hill Mineral Springs, L. Walkmeister, Prop.		Sutter Creek	Mokelumne Hill
Contra Costa County			
Alhambra Spring, L. M. Lasell		Martinez	Martinez
Fresno County			
Mercey Mineral Springs Co., F. J. Bourn, Pres.		810 California Bldg., Los Angeles	Los Banos
Inyo County			
Coso Hot Springs, Inc.		Coso Hot Springs	Coso Hot Springs
Lake County			
Adams Mineral Springs, Clarence Prather		Adams, via Middletown	Adams
Bartlett Spring Co.		163 Turk St., San Francisco	Bartlett Springs
Norman Mineral Springs, H. C. Norman, Mgr.		Middletown	Middletown
Witter Springs, Inc., J. A. Carroll, Pres.		62d and La Salle Sts., Chicago, Ill.	Witter Springs
Los Angeles County			
Cascade Water Co.		4556 York Blvd., Los Angeles	Los Angeles
Elysian Spring Water		1536 Baxter, Los Angeles	Los Angeles
Holly Spring Water		2298 Holly Dr., Los Angeles	Los Angeles
Magnetic Spring Water Co.		936 Palm Ave., Sherman	Los Angeles
Mission Spring Water Co.		8938 Keith, Hollywood	Los Angeles
Mountain Spring Water Co.		226 S. Avenue 54, Los Angeles	Los Angeles
Pure-lax Mineral Water Co.		3640 Griffin, Los Angeles	Los Angeles
Rose Springs-California Spring Water Co.		4835 Pasadena Ave., Los Angeles	Los Angeles
Sparklett Bottled Water Co.		4500 York Blvd., Los Angeles	Los Angeles
Marin County			
Tamalpais Natural Mineral Water Springs, Borello Bros.		San Rafael	San Rafael

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Napa County			
G. Musante		Calistoga	Calistoga
Napa Soda Springs Co., G. H. T. Jackson		1142 Mission St., San Francisco	Napa
Napa Vichy Springs, John Lepori		Napa	Napa
Samuels Soda Springs, R. J. Little		Monticello	Monticello
Walters Mineral Water, St. Helena Bottling and Cold Storage Co.		St. Helena	Pope Valley
Orange County			
La Vida Mineral Water Co.		927 W. 2d St., Los Angeles	Carbon Canyon
Riverside County			
Beulah Springs, Oscar C. McNicholl		Arlington	Arlington
San Bernardino County			
Arrowhead Hot Springs, California Consolidated Water Co.		Washington St. and Compton Ave., Los Angeles	Arrowhead
San Diego County			
Buckman Springs		3984 Idaho St , San Diego	Pine Valley
Rock Springs Co., E. S. Walck		R. 2, Box 442, Escondido	Escondido
San Luis Obispo County			
Mary Hill Mineral Well Co., Fred Merckel		Paso Robles	Paso Robles
Santa Barbara County			
Veronica Mineral Springs Co.		699 Brannan St., San Francisco	Santa Barbara
Santa Clara County			
Calaveras Water Co., G. W. Fieger		354 E. Santa Clara St., San Jose	San Jose
San Jose Water Co., Mr. C. Wood		459 Minor Ave., San Jose	Alma
Siskiyou County			
The Shasta Water Co.		6th and Brannan Sts., San Francisco	Dunsmuir
Yreka Bottling Works, Fred J. Meamber, Prop.		Yreka	Little Shasta
Sonoma County			
Agua Caliente Springs Co., T. H. Corcoran, Prop.		Agua Caliente	Agua Caliente
Boyes Springs Bottling Works, F. W. Peterson, Mgr.		Boyes Springs	Boyes Springs
Barcal Springs, John Kolling		Preston	Preston
Fetters Mineral Springs, George Fetters		Fetters Springs	Fetters Springs

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PLATINUM

Operator		Address	Location of mine
Amador County			
Lancha Plana Gold Dredging Co.		Comanche	Comanche
Butte County			
Shasta-Butte Gold Dredging Co.		614 Financial Center Bldg., San Francisco	Oroville
Sacramento County			
Natomas Co.		Forum Bldg., Sacramento	Natoma
Siskiyou County			
J. F. Burger		c/o Klamath Kamp, Hornbrook	Hornbrook
Trinity County			
Fred A. Lash		Hayfork	Hayfork
William Cochran		Helena	Helena

POTASH

Operator		Address	Location of plant
San Bernardino County			
American Potash and Chemical Co.		**Trona**	**Trona**

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San Bernardino County
American Potash and Chemical Co. | Trona | Trona

PUMICE OR VOLCANIC ASH

Operator	Product	Address	Location of quarry
Fresno County			
Earlonite Mining Co., L. T. Bennett and Earl Bennett	b	P. O. Box 474, Selma	Friant
Fort Miller Pumicite, A. H. McKenzie	b	Griffith-McKenzie Bldg., Fresno	Friant
Imperial County			
A. W. Brand Property*	a	880 E. Colorado St., Los Angeles	Calipatria
The Kalite Co., O. J. Salisbury	a	90 Oak Knoll Ave., Los Angeles	Calipatria
Inyo County			
Chas. Brown	a	Shoshone	Shoshone
Victorville Lime Rock Co.	a	2149 Bay St., Los Angeles	Caso Junction
Kern County			
Cudahy Packing Co.	b	803 Macy St., Los Angeles	Ceneda
Mono County			
California Quarries Corp.	a	1300 Quinby Bldg., Los Angeles	Laws
San Luis Obispo County			
Golden State Cleaner Mine, M. L. Francis	b	Creston	Creston
Siskiyou County			
Pumice Well Deposit, Chas. Grandjean & Co.	a	774 High St., Oakland	

a. Pumice. b. Volcanic ash. * Leased to the Kalite Co. in July.

PYRITE

Operator	Product	Address	Location of mine
Alameda County			
Leona Chemical Co., D. A. McDonnell		Syndicate Bldg., Oakland	Leona Heights
Shasta County			
Mountain Copper Co., Wm. F. Kett, Mgr.		112 Market St., San Francisco	Matheson

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QUICKSILVER

Mine	Operator	Address	Location of mine
Colusa County			
Manzanita	Shanjay Quicksilver Mining Co.	260 California St., San Francisco	Wilbur Springs
Contra Costa County			
Ryne	Mt. Diablo Mining Co., Blumberg, Moris & Johnson	Clayton	Clayton
Fresno County			
Archer	Joseph Byles & Sons[1]	Coalinga	Panoche
Archer	Hamilton Carhart, Jr.	880 Rosalind Rd., Pasadena	Panoche
Mercy	Wm. R. Biaggi	Auzerias Bldg., San Jose	Little Panoche Cr.
Kern County			
Cuddeback	Santa Ana Mining Co., C. D. Holmes, Jr., Pres.	1408 N. Main St., Santa Ana	Tehachapi
Lake County			
Baker	John Jago	Lower Lake	Lower Lake
Mirabel	Mirabel Quicksilver Co., H. C. Davey, Supt.	Middletown	Middletown
Red Elephant	Forrest D. Saunders	2715 Franklin St., San Francisco	Rieff
Sulphur Bank	Sulphur Bank Syndicate, W. Bradley, Mgr.	Clear Lake	Lower Lake
Monterey County			
Patriquin	Bibby Con. Mining Co., Peter Buol	4845 Angeles Vista Blvd., Los Angeles	Parkfield
Napa County			
Bella Oaks	Bella Oaks Mining Co., S. H. Wyckoff	1015 First St., Napa	Rutherford
Knoxville	Geo. E. Gamble	Monticello	Monticello
La Joya & Oat Hill	Acme Mining & Milling, Inc.	Alto Bldg., San Francisco	Oakville & Oat Hill
San Benito County			
Aurora	Hamilton Carhart	880 Rosalind Rd., Los Angeles	Idria
Florence Mac	Joe Stokes	1252 Pine Ave., Long Beach	Hernandez
New Idria	New Idria Quicksilver Mines, Inc.	Merchants Exchange Bldg., San Francisco	Idria
Stayton	R. B. Knox	Hollister	Hollister

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San Luis Obispo County			
Carson	Ellard W. Carson	San Luis Obispo	Adelaida
Inez	United Bonanza Mining Co., Ltd., Frank A. Crampton	Adelaida	Adelaida
Mahoney	Premier Metals Corp.	Merchants Exchange Bldg., San Francisco	Adelaida
Oceanic	H. W. Gould	Mills Bldg., San Francisco	Cambria
Rinconada	Mercury Corp. of America, Ltd.	Box 537, Santa Monica	Santa Margarita
Santa Barbara County			
Los Prietos	Los Prietos Quicksilver Mining Co., F. M. Townsend	912 Higgins Bldg., Los Angeles	Los Prietos
Santa Clara County			
Biaggi	Wm. R. Biaggi	Auzerias Bldg., San Jose	Silver Creek
New Almaden (dump)	Ben Black	Almaden	Almaden
Santa Clara	Santa Clara Quicksilver Corp., Fred D. Murphy	Box 189, Luther Ave., Los Gatos	Edenvale
Siskiyou County			
Great Northern	Mercury Mines, Eugene Aureguy	Mills Bldg., San Francisco	Gottville
Solano County			
Hastings	H. L. Slosson	333 Kearny St., San Francisco	Vallejo
St. Johns	St. Johns Mining Co., R. V. Joste, Secy.	1022 Crocker Bldg., San Francisco	Vallejo
Sonoma County			
Amazon	L. D. Kessack	Cloverdale	Cloverdale
Cloverdale	Cavagnaro & Schor, Lessees[2]	Cloverdale	Cloverdale
Cloverdale	Nevada Quicksilver Co.	Lovelock, Nev.	Cloverdale
Trinity County			
Altoona	Altoona Quicksilver Mining Co., J. Frowenfield, Pres.	2446 Washington St., San Francisco	Castella

[1] Taken over by Hamilton Carhart, Jr. during 1930.
[2] Operated until August 20, 1930, by Cavagnaro & Schor.

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SALT

Operator		Address	Location of plant
Alameda County			
Arden Salt Co.		225 Bush St., San Francisco	Newark and Mt. Eden
California et al. Plants, Leslie-California Salt Co.		Alexander Bldg., San Francisco	Alvarado
Oliver Salt Co.		Mt. Eden	Mt. Eden
Inyo County			
Sierra Salt Co.		512 S. Alameda, Los Angeles	Saline Valley
Kern County			
Consolidated Salt Co.		P. O. Box 28, Long Beach	Saltdale
Los Angeles County			
Long Beach Salt Co.		P. O. Box 28, Long Beach	Long Beach
Modoc County			
Surprise Valley Salt Works, Joshua H. Hutchinson		Box 26, Lake City	Lake City
Monterey County			
Monterey Bay Salt Co., E. C. Vierra, Mgr.		Moss Landing	Moss Landing
San Bernardino County			
California Rock-Salt Co.		2465 Hunter St., Los Angeles	Amboy
Saline Products, Inc.		2000 Santa Fe Ave., Los Angeles	Amboy
San Diego County			
Western Salt Co.		917 J. D. Spreckels Bldg., San Diego	San Diego
San Mateo County			
Leslie Salt Plant, Leslie-California Salt Co.		Alexander Bldg., San Francisco	Leslie
Stauffer Chemical Co.		636 California St., San Francisco	Redwood City
Santa Clara County			
Alviso Salt Co., V. S. Hardy, Pres.		Russ Bldg., San Francisco	Alviso

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SANDSTONE

Operator		Address	Location of quarry
Los Angeles County			
Bender Bros., W. H. Bender		321 Grant St., Pasadena	Boquet Canyon
R. C. Cole & Co.		7160 Beverly Blvd., Los Angeles	
Robert Cox		1975 Lundy Ave. Pasadena	
R. L. Glover		917 W. 6th St., Los Angeles	Chatsworth
Dan J. Poyer		Star Rt., Owensmouth	Calabasas
Frank Welsh		8912 Sunset Blvd., Los Angeles	
West Coast Flagstone, Guy T. Felty		1226 S. Bedford, Los Angeles	
Western Quarries, Inc.		Wilshire Blvd., Beverly Hills	
Monterey County			
Carmel Stone Quarries, Arthur H. Anthony		2752 Filbert St., San Francisco	Carmel
Santa Lucia Quarries, Ltd., John Bathen		Carmel	Carmel
Sierra Quarry, Harry Rogers		Box 136, Carmel	Carme
Napa County			
H. F. Galbreath		1742 Solano St., Berkeley	
Sonoma County			
S. Cabrol		Glen Ellen	Glen Ellen
Tehama County			
H. F. Galbreath		1742 Solano St., Berkeley	

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SILICA

Operator	Product	Address	Location of mine
Contra Costa County			
Silica Co. of California, R. M. Greathouse	b	Merchants Exchange Bldg., San Francisco	Brentwood
El Dorado County			
Snow Silica Deposit, Spicky Polish Corp., Owners	a	1401 3d St., San Francisco	Placerville
Inyo County			
Inyo Marble Co.	a	361 N. Avenue 22, Los Angeles	Lone Pine
Monterey County			
Del Monte Products, A. J. Gunnell	b	Crocker Bldg., San Francisco	Del Monte
Placer County			
Harry McCormick	a	Alta	Alta
Riverside County			
American Encaustic T. Co.	a	52d and S. Alameda Sts., Los Angeles	Murrieta
P. J. Weisel	b	La Habra	Corona
San Diego County			
Flint Silica and Spar Co.	a	1047-61 Richmond St., Los Angeles	

a. Quartz. b. Glass sand.

SILLIMANITE-ANDALUSITE-CYANITE GROUP

Operator	Product	Address	Location of mine
Imperial County			
Vitrefrax Corp.	Cyanite	5050 Pacific St., Vernon, Los Angeles	Ogilby
Mono County			
Champion Porcelain Co., Dr. J. A. Jeffery, Pres.	Andalusite	Butler Ave. and Grand Trunk R. R., Detroit, Mich.	Mocalno

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SILVER

Principal Silver Producers in California in 1930

Mine	Type of Mine	Operator	Address	Location of mine
Amador County				
Argonaut	a	Argonaut Mining Co.	1404 Humboldt Bk. Bldg., San Francisco	Jackson
Central Eureka	a	Central Eureka Mg. Co.	111 Sutter St. San Francisco	Sutter Creek
Kennedy	a	Kennedy Mg. and Mg. Co.	519 California St., San Francisco	Martell
Inyo County				
Carbonate	c	Helene M. Salsberry, Lessee	2250 Green St., San Francisco	Shoshone
Estelle & Cerro Gordo	c	American Smelting & Refining Co.	McCormick Bldg., Salt Lake, Utah	Keeler
Mono County				
Comanche	d	Comanche Mg. & Red. Co.	433 S. Spring St., Los Angeles	Benton
Napa County				
Palisade	b	Banner Dev. Co., Lloyd L. Root	57 Post St., San Francisco	Calistoga
Nevada County				
Empire and North Star	a	Empire Star Mines, Ltd., William A. Simkins	648 Mills Bldg., San Francisco	Grass Valley
Idaho-Maryland	a	Idaho-Maryland Mines Co., Errol MacBoyle, Mgr.	Hobart Bldg., San Francisco	Grass Valley
Murchie	a	American Foundation Co.	P. O. Box 687, Nevada City	Nevada City
Plumas County				
Engels	d	Engels Copper Mg. Co.	Mills Bldg., San Francisco	Engel Mines
Walker	d	Walker Mining Co.	Kearns Bldg., Salt Lake City, Utah	Walkermine
Sacramento County				
Natomas	d	Natomas Co.	Forum Bldg., Sacramento	Natomas
San Bernardino County				
Bonanza King	c	T. L. Bright, et al.	Fenner	Fenner
Calico group	b	Zenda Gold Mining Co.	Yermo	Yermo
Santa Fe & Uranium group	b	Wortley Cons. Mines, Inc.	Red Mountain	Red Mountain

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SILVER—Continued

Principal Silver Producers in California in 1930

Mine	Type of Mine	Operator	Address	Location of mine
Shasta County				
Hornet	a	The Mountain Copper Co., Ltd., W. S. Howard	112 Market St., San Francisco	Matheson
Sierra County				
Original 16 to 1	a	Original 16 to 1, Inc.	Monadnock Bldg., San Francisco	Alleghany
Siskiyou County				
Blue Ledge	d	Consolidated Copper Mining Co.	P. O. Box 149, Tacoma, Wash.	P. O., Copper, Ore.
Trinity County				
Island Mountain	d	Island Copper Co., E. R. Leach, Mgr.	Easton Bldg., Oakland	Island Mountain
Yuba County				
Yuba	a	Yuba Cons., Hammon Eng. Co.	351 California St., San Francisco	Hammonton

a. Gold. b. Silver. c. Silver-Lead. d. Copper.

SLATE

Operator		Address	Location of quarry
El Dorado County			
Pacific Minerals, Inc.		332 10th St., Richmond	Chili Bar
Tuolumne County			
Whitney Slate Quarry, W. S. McLean		1919 San Bruno Ave., San Francisco	Hetch Hetchy

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SOAPSTONE AND TALC

Operator	Product	Address	Location of mine
Butte County			
McLean Talc Deposit W. S. McLean	a	1919 San Bruno Ave., San Francisco	McLean Spur
El Dorado County			
Pacific Minerals Co., Ltd., Chas S. Renwick	a	337 10th St., Richmond	Shrub
John Wilbur	a	Kelsey	Kelsey
Inyo County			
Sierra Talc Co Franklin Booth, Mgr.	b	401 Equitable Bank Bldg., Los Angeles	Keeler
Western Talc and Magnesite Co.	b	1901 E. Slauson Ave., Los Angeles	Death Valley
Los Angeles County			
R. C. Cole & Co., R. C. Cole, Mgr.	a	7160 Beverly Blvd., Los Angeles	
San Bernardino County			
Pacific Coast Talc Co.	b	2149 Bay St., Los Angeles	Silver Lake

a. Soapstone. b. Talc.

SODA

Operator	Product	Address	Location of plant
Inyo County			
Inyo Chemical Co.		Cartago	Cartago
Natural Soda Products Co., W. W. Waterson		Bishop	Keeler
Pacific Alkali Co.		1206 Pacific Mutual Bldg., Los Angeles	Bartlett
San Bernardino County			
West End Chemical Co.		West End	Searles Lake

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STONE, MISCELLANEOUS

Under the heading of stone, miscellaneous, there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes all crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

NOTE.—The California State Highway Commission produces both crushed rock and sand and gravel in various places in the state used in construction and maintenance of highways, but not specified in this listing.

Operator	Product	Address	Location of pit or quarry
Alameda County			
Bilger Property Co., Mr. F. W. Bilger	b	5000 Broadway, Oakland	Oakland
Central Construction Co., Leona Quarry and Heyland Quarry*	b	Oakland Bank Savings Bldg., Oakland	Oakland
Hanifen Trucking Co.	a	Pleasanton	Pleasanton
Hayward Building Materials Co., Stevenson Gravel Pit	b	Atherton & Jackson Sts., Hayward	Decoto
Heafey Moore Co., Leona & Hayland Quarries	b	344 High St., Oakland	Oakland
J. F. Johnson	a	P. O. Box 232, Livermore	Livermore
Kaiser Paving Co.	a	1522 Latham Square Bldg., Oakland	Eliot
Kemper Bros.	b	Rt. 1, Box 197, Strabridge Ave., Hayward	Hayward
Lake Chabot Quarry, O. F. Chichester	b	1273 Foothill Blvd., San Leandro	San Leandro
Langdon Molding Sand, J. H. Langdon	c	R. F. D. Box 89, Niles	Decoto
Red Shale Quarry, W. S. McLean	d	1919 San Bruno Ave., San Francisco	Arroyo Mocho
Mtn. View Cemetery Assn.	b	Oakland	Piedmont
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Eliot and Niles
Ramos Quarry, Ramos Bros.	a	C and 7th Sts., Hayward	Hayward
Rhodes Jamieson & Co., G. G. Jamieson, Gen. Mgr.*	a	Park and Blanding, Oakland	Eliot
Russell Bros. Quarry, B. and L. Russell	b	1192 Russell Way, Hayward, California	Hayward
San Leandro Rock Co., Lake Chabot Quarry	b	1273 Foothill Blvd., San Leandro	Lake Chabot
Amador County			
Amador County	a, b	Jackson	
Hemstreet & Bell	b	411 C St., Marysville	
Pacific Gas and Elec. Co.	b	245 Market St., San Francisco	Salt Springs
Butte County			
Butte County	a, b	Oroville	
Bechtel-Kaiser Co., R. J. Kennedy, Mgr.	b	Oroville	Oroville
J. E. Johnston Rock Co.	a, b	Chico	Chico
McLean Quarry	d	1919 San Bruno Ave., San Francisco	McLean Spur
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Oroville

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Calaveras County			
Calaveras County	b	San Andreas	
Pacific Gas & Electric Co.	b	245 Market St., San Francisco	Salt Springs
Pacific Minerals, Inc.	d	337 10th St., Richmond	Angels
Colusa County			
Colusa County	a	Colusa	
Contra Costa County			
Antioch Sand Co.	a	312 Loew Bldg., San Francisco	Antioch
Blake Bros. Co., Anson S. Blake	b	204 Balboa Bldg., San Francisco	Point Richmond
Central Construction Co., Mr. C. D. Bates, Mgr.*	b	Oakland Bank Savings Bldg., Oakland	Stege
Coburn Sand Plant, C. W. Coburn, Jr.	a	2780 Sacramento St., San Francisco	Antioch
Columbia Steel Co.	c	Pittsburg	Pittsburg
Heafey Moore Co.	b	344 High St., Oakland	Stege
Hutchison Co., Stege Quarry	b	1450 Harrison St., Oakland	Stege
E. B. & A. L. Stone Co., Antioch Sand Pit	a	810 Claus Spreckels Bldg., San Francisco	Antioch
Morris Sand Pit, Ben Morris	a	Antioch	Antioch
Oak Point Sand Co.	a	Antioch	Antioch
Silico Co. of Calif., Ltd.	c	Merchants Exchange Bldg., San Francisco	Brentwood
Del Norte County			
Del Norte County	a, b	Crescent City	
Hemstreet & Bell	a, b	411 C St., Marysville	Klamath
Webber Construction Co., H. Webber	a, b	Crescent City	
El Dorado County			
El Dorado County	a	Placerville	
Diamond Springs Lime Co.	b	Diamond Springs	Diamond Springs
Morgan Rock Quarry, D. E. Douglas, Supt.	b	Georgetown	Georgetown
U. S. Bureau of Public Roads	b	461 Market St., San Francisco	
U. S. Forest Service	b	Ferry Building, San Francisco	
Fresno County			
Grant-Service Rock Co., Cons.	a, b	T. W. Patterson Bldg., Fresno	El Prado
Pacific Coast Aggregates, Inc.	b	85 2d St., San Francisco	Piedra
Glenn County			
Southern Pacific R. R. Co., Asst. Chief Engr.	a	Southern Pacific Bldg., San Francisco	Wyo
Stony Creek Gravel Co., H. S. Tweed	a	Willows	Wyo

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand.
* Central Construction Co. was taken over by Heafey Moore Co.

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STONE, MISCELLANEOUS—Continued

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Operator	Product	Address	Location of pit or quarry
Humboldt County			
Humboldt County	a	Eureka	
Engelhart Pav. and Construction Co.	a, b	Foot of S St., Eureka	Arcata
J. Ferguson	a	Arcata, R. F. D.	Arcata
Fortuna, Street Supt.	a	Fortuna	Fortuna
Northwestern Pacific R. R. Co., Wm. N. Neff, Gen. Supt.	a	Sausalito	South Fork
Mercer Fraser Co.	a, b	Second and Commercial Sts., Eureka	Essex & Fernbridge
Imperial County			
Imperial County	a, b	El Centro	
Imperial Irrigation Dist., Gen. Supt. River Div.	b	Andrade	Andrade
Imperial Rock Corp.	a, b	P. O. Box 6, Niland	Niland
S. E. Layman	a	Holtville	Holtville
Potholes Granite Quarry, U. S. Bureau of Reclamation	b	Winterhaven, c/o Yuma, Arizona	Winterhaven
Pacific Mineral Rock Prod. Co., C. E. Allebrand	d	2440 E. 56th St., Los Angeles	Ogilby
Inyo County			
Inyo County	b	Independence	
Inyo Marble Co.	b, d	406 S. Main St., Los Angeles	Lone Pine
Los Angeles, Dept. of Water & Power	a, b, g	207 S. Broadway, Los Angeles	
Kern County			
Kern County	a	Bakersfield	
Bakersfield Rock and Gravel Co.	a, b, h	Box 395, Station A, Bakersfield	
Kern Rock Co., Ltd.	a, b	P. O. Box 1697, Bakersfield	Kern River
Klassen Sand Pit, P. P. Klassen	a	1010 31st St., Bakersfield	Bakersfield
Los Angeles, Dept. of Water & Power	a, b	207 S. Broadway, Los Angeles	
T. P. Pyle Sand Co.	a	514 30th St., Bakersfield	Bakersfield
Southern California Edison Co., Ltd.	a	Edison Bldg., Los Angeles	
Lake County			
Lake County	a	Lakeport	
Jim Gunn	a	Kelseyville	Kelseyville
Chas. Kuppinger	a	Lakeport	Lakeport

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Lassen County			
County Rock Crusher	b	Susanville	
Los Angeles County			
Associated Rock Co.	a	1000 N. La Brea St., Los Angeles	
A. T. & S. F. R. R., I. L. Hibbard, Gen. Mgr.	a	609 Kerckhoff Bldg., Los Angeles	Forbes
Richard R. Ball	a	221 Ave. D., Redondo Beach	Torrance
Bengal & Sons	a	1709 Monte Vista, Pasadena	Pasadena
Blue Diamond Co.	a	1650 S. Alameda St., Los Angeles	El Monte & Roscoe
Bouquet Canyon Flagstone Co., W. H. Pinder, Mgr.	b	321 Grant St., Pasadena	Bouquet Canyon
Concrete Materials Corp., F. M. McAvoy[1]	b	P. O. Box 758, North Hollywood	
Consolidated Rock Products Co.	a, b	656 S. Los Angeles St., Los Angeles	Whittier & Fullerton
Ducey & Atwood Rock Co., R. K. Atwood, Pres.	a, b	Box 194, East Pasadena	East Pasadena
Eaton Canyon Rock and Sand Co.	a, b	2350 E. Colorado St., Pasadena	Pasadena
Graham Bros.	a, b, g	Long Beach	Catalina Island & Roscoe, El Monte & Rancho Qua's
Lindauer Corp.	a	Box 208, La Habra	La Habra
Los Angeles City Rock and Gravel Plants Engineer's Office	a	Los Angeles	Los Angeles
Los Angeles Har. Dept., Bureau of Maintenance	b	City Hall, San Pedro	Santa Catalina
Los Angeles Decomposed Granite Co.	g	2171 W. Washington, Los Angeles	
Los Angeles Rock and Gravel	a	Box 3439 Pasadena Ave., Los Angeles	Los Angeles
J. S. Nickolson	a, b	450 Ramona St., Los Angeles	San Gabriel
Pavers Rock Co., Ltd.	a, b	622 C. C. Chapman Bldg., Los Angeles	Tujunga
Reynolds Crushed Gravel	g	920 N. Humphreys Ave., Los Angeles	Los Angeles
Santa Catalina Island Co.	a, b, g	Avalon	Santa Catalina Island
Edwin Sidebotham & Son., Inc., Sidebotham Sand Plant	a	McFarland & L Sts., Wilmington	Lomita
Sierra Rock & Materials Co., Geo. Wiegand, Mgr.[1]	a, b	P. O. Box 206, El Monte	El Monte
Walter L. Stine	a	Burbank	Lankershim
Frank Walsh	b	8912 Sunset Blvd., Los Angeles	
Marin County			
Marin County	a	San Rafael	
Daniels Con. Co.	b	503 Market St., San Francisco	San Rafael
Hutchison Company	b	1450 Harrison St., Oakland	San Quentin
Mariposa County			
Mariposa County	a	Mariposa	
Kelm Jasper Quarry, H. J. Kelm	d	Bagby	Bagby
Yosemite National Park	a, b	Yosemite	Yosemite Ntl. Park

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). d. Granules for roofing, terrazzo. g. Decomposed granite. h. Earth.
[1] Taken over by the Consolidated Rock Products Co. in Sept.

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STONE, MISCELLANEOUS—Continued

Under the heading of stone, miscellaneous, there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes all crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
Mendocino County			
Mendocino County	a	Ukiah	
John Freitas	a	Ukiah	Ukiah
Hemstreet & Bell	a	411 C St., Marysville	Longvale & Laytonville
M. D. Perkins	a	Fort Bragg	Fort Bragg
Merced County			
Merced County	a	Merced	Los Banos
Hammatt Gravel Plant, V. M. Hammatt	a, b	Livingston	Livingston
Modoc County			
Modoc County	a	Alturas	
The Renshaw Sand, Rock & Gravel Co.	a	Alturas	Alturas
Mono County			
California Quarries Corp.	a	1300 Quimby Bldg., Los Angeles	Laws
U. S. Bureau of Public Roads	a	461 Market St., San Francisco	
Monterey County			
Monterey County	b	Salinas	
Del Monte Properties, A. J. Gunnell	a, c	401 Crocker Bldg., San Francisco	Pacific Grove
Wm. Machado	a	Box 424, Carmel	Carmel
Monterey Sand Co.	a, c	Monterey	Monterey
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Lapis and Pratteo
A. Teichert & Son	b	1846 37th St., Sacramento	
Napa County			
Napa County	a, b	Napa	Napa
Basalt Rock Co.	b	8th St., Napa	Napa
John Cassaretto	a	6th & Channel Sts., San Francisco	Napa
Errington Quarry, Ray Errington	a	Napa	Napa
City of St. Helena Gravel Pit	a	St. Helena	St. Helena

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Napa & Calistoga R. R., Butala Gravel Pit, S. F.	a	Napa	St. Helena
Thorsen Gravel Pit, Harry Thorsen	a	St. Helena	St. Helena
Weinberger Gravel Pit, Mrs. H. E. Weinberger	a	St. Helena	St. Helena
Nevada County			
Nevada County	b	Nevada City	
Orange County			
Orange County	g	Santa Ana	
Bruce Bros.	g	Yorba Linda	Yorba Linda
Consolidated Rock Products Co.	a, b	656 S. Los Angeles St., Los Angeles	Whittier & Fullerton
Graham Bros.	a	Long Beach	Orange
T. F. Harmon	a	Route 4, Box 297, Anaheim	Garden Grove
A. J. Jorgensen	a	Garden Grove	Garden Grove
National Cement Pipe Co.	e	Drawer K, Santa Ana	Santa Ana
Reynolds Gravel Service	g	715 Hickory St., Santa Ana	Santa Ana
Sparkes & McClellan	a	R. 3, Box 244, Anaheim	Olive
Spurlock Sand Pit	a	Garden Grove	Garden Grove
B. A. Stoffel	a	Anaheim	Anaheim
Placer County			
Placer County	a	Auburn	
Alexson Granite Co.	b	Rocklin	Rocklin
Hemstreet & Bell	b	411 C St., Marysville	Cisco
A. Pernu Granite Quarries, Adolph Pernu	b	Rocklin	Rocklin
Roseville Sand Co.	a	Roseville	Roseville
Rocklin Granite Co., H. M. Grindell	b	Rocklin	Rocklin
Union Granite Co., Mat Ruhkala	b	Rocklin	Rocklin
Plumas County			
U. S. Bureau of Public Roads	b	Sheldon Bldg., San Francisco	Morgan Spring and Spring Garden
Western Pacific R. R. Co., E. W. Mason, Gen. Supt.	b	Mills Bldg., San Francisco	
Riverside County			
Riverside County	a	Court House, Riverside	
Hauser Construction Co., Ormand Quarry	b	Security Bldg., Long Beach	Bly Junction
Kuster & Waterburg	a	Corona	Corona
Nevada-Pacific Mineral Co., Inc.	c	3363 Fruitland Rd., Los Angeles	Grand Terrace
City of Riverside	b	Riverside	Riverside
The Service Gravel Co., F. A. Braman	a, b	4324 10th St., Riverside	Riverside
P. J. Weisel, Industrial Sands	a, c	La Habra	Corona

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. e. Slag. g. Decomposed granite.

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STONE, MISCELLANEOUS—Continued

Under the heading of stone, miscellaneous, there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes all crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
Sacramento County			
Cannon & Co.	c	Box 281, Sacramento	Ben Ali
Construction Materials Co.	a	24th St. and American River, Sacramento	American River
Del Paso Rock and Gravel Co.	a, b	H St. Rd., Sacramento	Del Paso
Folsom State Prison	b	Represa	Represa
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Fair Oaks, Mayhew and American River
San Benito County			
San Benito County	a	Hollister	
Granite Rock Co.	b	Drawer M, Watsonville	Logan
San Bernardino County			
San Bernardino County	b	San Bernardino	
Hanawalt Bros.	a	2151 D St., La Verne	La Verne
V. P. Hunt	a	Redlands	Redlands
Los Angeles & Salt Lake R. R., Chief Engineer	b	Pacific Electric Bldg., Los Angeles	
Pacific Minerals, Inc.	d	337 10th St., Richmond	Barstow
Pinneys Sand & Rock Service	a, b	Redlands	Redlands
Redlands Gravel Co.	a, b	Redlands	Redlands
San Bernardino Rock and Gravel Co.	a	941 E St., San Bernardino	San Bernardino
Southern Pacific Co., Asst. Chief Engineer	a	Southern Pacific Bldg., San Francisco	Guasti
Triangle Rock and Gravel Co.	a, b	San Bernardino	San Bernardino
Veuz Bros., Declez Quarry	b	Box 212, Fontana	Declez
San Diego County			
Calaveras Rock Corp.	b	Oceanside	Oceanside
Canyon Rock Co.	a	3911 5th Ave., San Diego	San Diego
Paul Challet	a	2155 Newton St., San Diego	San Diego
Cooper & Nelson	a	629 1st St., San Diego	San Diego
Daley Corp., George Daley	a, b	4440 Boundary St., San Diego	San Diego
V. R. Dennis Construction Co.	a	P. O. Box F, Sta. A, San Diego	San Diego

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H. G. Fenton Material Co.	a, b	13th and Imperial Ave., San Diego	San Diego
R. E. Hazard Construction Co., Inc.	b	2548 Kettner Blvd., San Diego	Rancho Santa Fe
F. L. Hieatt	c	P. O. Box 865, San Diego	San Diego
R. M. Hubbard	c	406 W. Nutmeg St., San Diego	San Diego
John T. Momand	f	Box 381, Carlsbad	Oceanside
National Sand Co., A. S. Johnson	a	Box 315, National City	National City
Nelson & Sloan	a	P. O. Box 832, Chula Vista	
Simpson-Pirnie Granite Co.	b	21st and N Sts., San Diego	Santee
Spreckels Commercial Co.	a, b	310 4th St., San Diego	Otay & San Diego
W. A. Thompson	a	3521 Eugene Pl., San Diego	
San Francisco County			
Mission Quarry Co.	b	210 Balboa Bldg., San Francisco	San Francisco
San Joaquin County			
Frank Marks	b	Newman	Tracy
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Riverbank
Santa Fe Sand and Gravel Co., W. A. Arlington	a	P. O. Box 271, Escalon	Escalon
San Luis Obispo County			
San Luis Obispo County	a	San Luis Obispo	
Granite Rock Co., Templeton Sand Plant	a	Drawer M, Watsonville	Templeton
Guiton Molding Sand, Harold E. Guiton	c	Oceano	Oceano
San Mateo County			
San Mateo County	b	Redwood City	
H. E. Casey Co.	a, b	Third and B Sts., San Mateo	
Daly's Quarry, Market St. Ry. Co.	b	58 Sutter St., San Francisco	Daly
Half Moon Bay Feed & Fuel Co., Torpy Quarry	b	Half Moon Bay	Half Moon Bay
Holy Cross Cemetery	b	Colma	Colma
Industrial Mineral Products, W. B. Vestal	c	970 Seventh St., San Francisco	
Ratterree Bros. Co.	b	400 Walbridge Blvd., San Francisco	South San Francisco
Santa Barbara County			
Santa Barbara County	b	Santa Barbara	
Gates Gravel Plant, Frank H. Gates	a	Santa Maria	Sisquoc
Lompoc, P. C. Schuck, St. Supt.	a	Lompoc	Lompoc
Midcoast Rock Co., Giovanola & West	b	19 E. Canyon Perdido, Santa Barbara	Pt. Honda
Seaboard Stone & Cons. Co., Santa Cruz Island Quarry	b	P. O. Box 507, San Pedro	Santa Cruz Island
Southern Pacific R. R. Co., Asst. Chief Engineer	b	Southern Pacific Bldg., San Francisco	Arlight

a. Sand and gravel. b. Crushed rock (macadam. ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. f. Tube mill pebbles.

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STONE, MISCELLANEOUS—Continued

Under the heading of stone, miscellaneous, there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes all crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
Santa Clara County			
County Surveyor, Santa Clara County	b	Hall of Records, San Jose	
G. H. Anderson	b	Mountain View, Santa Clara County	
Beasworrick Gravel Pit, Beasworrick Bros.	a	75 W. Howe St., San Jose	San Jose
Bright Gravel Co., William H. Bright	a	740 S 3d St., San Jose	Coyote Creek
Carroll Gravel Pit, R. D. Carroll	a	950 S. 6th St., San Jose	San Jose
Hutchison Co., Stanford Quarry	b	1450 Harrison St., Oakland	Palo Alto
A. G. Jahn	a	Rt. 4, Box 362, San Jose	San Jose
Jas. A. Lemieux	a	Box 341, Senter Rd., San Jose	San Jose
Los Gatos Sand and Gravel Co.	a	Los Gatos	Los Gatos
J. W. Lovejoy	b	Rt. 1, Box 88, Mountain View	Mountain View
Martin Bros.	a	1350 Alviso St., Santa Clara	Coyote Creek
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Coyote and Campbell
A. J. Raisch	a	305 Burrell Bldg., San Jose	Coyote Creek
City of San Jose Sandpits, City Manager	a	San Jose	Coyote Creek
Teaffe Construction Co.	b	Los Altos	Los Altos
Santa Cruz County			
Central Supply Co.	a	P. O. Box 543, Santa Cruz	Santa Cruz
Mead Felton S. & G. Co., Harvey Mead	a	Felton	Felton
Geyer Gravel Plant, J. C. Geyer	a	Santa Cruz	Santa Cruz
Olympic Sand Co.	a	1240 Russ Bldg., San Francisco	Olympia
Pacific Limestone Prod. Co.	b	Santa Cruz	Santa Cruz
Santa Cruz Portland Cement Co.	b	Crocker Bldg., San Francisco	Davenport
Shasta County			
Shasta County	a, b	Redding	
Crews Gravel Pit, Philip Crews	a	17 N. Pine St., Redding	Sacramento River
Diestelhorst Gravel Plant, Chas. Diestelhorst	a, b	1040 Liberty St., Redding	Redding
Lassen Volcanic Nat. Park	b	Mineral via Red Bluff	Lassen Nat. Park
Southern Pacific R. R. Co., Asst. Chief Engineer	b	Southern Pacific Bldg., San Francisco	Kennett
U. S. Bureau of Public Roads	b	461 Market St., San Francisco	

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Sierra County			
Sierra County	a	Downieville	
U. S. Bureau of Public Roads	b	461 Market St., San Francisco	
Siskiyou County			
Siskiyou County	b	Yreka	
A. Hoey Sand Pit, c/o A. F. Graham	a	Klamath Falls, Oregon	Hoey
Kaiser Paving Co.	b	American Bank Bldg., Oakland	
Southern Pacific R. R. Co., Asst. Chief Engineer	a	Southern Pacific Bldg., San Francisco	Kigg
Solano County			
Cordelia Rock Quarry, E. B. and A. L. Stone Co.	b	Claus Spreckels Bldg., San Francisco	Thomasson
Sonoma County			
Sonoma County	a	Santa Rosa	
Commercial Gravel Co., H. G. Burrowes	a	530 Mills Bldg., San Francisco	Geyserville
Hein Bros. Basalt Rock Co., Mark Hein, Pres.	b	Petaluma	Petaluma
Helberg Gravel Plant	a	Shellville	Shellville
Independent Gravel Co.	a	Forestville	Forestville
McPherson Gravel Pit, E. McPherson	a, b	Cloverdale	Cloverdale
Mirabel Gravel Co., S. Cangros	a	222 3d St., San Rafael	Mirabel
Mirabel Gravel Co.	a	Forestville	Forestville
Petaluma and Santa Rosa E. R. R., E. H. Maggard, Mgr.	b	Petaluma	Stony Point
Russian River Gravel Co., J. D. Grant, Mgr.	a	Healdsburg	Healdsburg
Stony Point Quarry, W. A. Wilson	b	Petaluma, Star Rt.	Stony Point
Stanislaus County			
Atlas Rock Co.	a, b	47 N. Grant St., Stockton	Orange Blossom
W. Haslan	a	Oakdale	Oakdale
Honeycutt & Co., H. Honeycutt	a	R. 4, Box 1626, Modesto	Modesto
Frank B. Marks	a, b	Newman	Crows Landing
Modesto Sand Pit, City of Modesto	a	City Hall, Modesto	Modesto
W. S. McLean	d	1919 San Bruno Ave., San Francisco	Knights Ferry
Oakdale Irrigation Dist., M. E. Robinson, Auditor	a	Oakdale	Oakdale
Putman Sand & Gravel Co.	a	Modesto	Modesto
Rinehart Sand Pit, Rinehart Bros.	a	Modesto	Modesto
Scanlon Gravel Plant, J. P. Scanlon	a	Patterson	Crows Landing
Service Bros. Gravel Plant	a, b	Waterford	Waterford
Stewart Gravel Pit, John Stewart	a	Crows Landing	Crows Landing
Tuolumne River Gravel Pit, Service Bros.	a	Waterford	Waterford

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). d. Granules for roofing, terrazzo.

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STONE, MISCELLANEOUS—Continued

Under the heading of stone, miscellaneous, there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes all crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
Tehama County			
Tehama County	a	Red Bluff	
U. S. Bureau of Public Roads	b	461 Market St., San Francisco	
Trinity County			
Trinity County	a	Weaverville	
Tulare County			
Tulare County	a	Visalia	
Duggan & Nelson	a	Porterville	Porterville
Visalia Transfer Co., Garland Sand Pit, G. A. Bigard	a	Visalia	Visalia
Porterville Cement Pipe Co.	a, b	P. O. Box 396, Porterville	Porterville
Sheldon Gravel Pit, O. C. Jeffers	a	520 Roche Ave., Porterville	Porterville
John R. White, Supt. Sequoia Natl. Park	a, b	Three Rivers	Sequoia Natl. Park
Tulare Rock Co., O. Holliday	a, b	Lindsay	Lindsay
Tulare Cement Pipe Co., S. Oegeda	a	Tulare	Tulare
Tuolumne County			
McLean Quarry, W. S. McLean	d	1919 San Bruno Ave., San Francisco	Sonora
Ventura County			
El Rio Rock Co.	a, b	P. O. Box 381, Ventura	El Rio
Fillmore Concrete Pipe Co.	a	Fillmore	Fillmore
El Rio Sand and Gravel Co.	a	2234 Thompson Blvd., Ventura	El Rio
Santa Clara Sand and Gravel Co.	a	2027 E. Main St., Ventura	Ventura
Santa Paula Rock Co.	a	Willard Bridge, Santa Paula	Santa Paula
Saticoy Rock Products Co.	a, b	Saticoy	Saticoy-Ventura
Ventura Velvet Molding Sand, Chas. A. Cole	c	1355 Church St., Ventura	Ventura
Yolo County			
Yolo County	a	Woodland	
Yolo Gravel Co.	a	P. O. Box 7, Yolo	Yolo
Yuba County			
Hemstreet & Bell	a, b	411 C St., Marysville	
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Marysville

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terrazzo.

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SULPHUR

Operator	Product	Address	Location of mine
Colusa County			
Elgin Mine, H. C. Warwick, Supt.		3769 Jackson St., San Francisco	Wilbur Springs

TUNGSTEN

Operator	Product	Address	Location of mine
Inyo County			
Round Valley Tungsten Co., Cooper Shapley		Bishop	
San Bernardino County			
Atolia Mining Co., A. V. Udell		1022 Crocker Bldg., San Francisco	Atolia

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APPENDIX

MINING BUREAU ACT

Chap. 679 [Stats. 1913]; amended, Chap. 280 [Stats. 1929.]

An act establishing a state mining bureau, creating the office of state mineralogi fixing his salary and prescribing his powers and duties; providing for t employment of officers and employees of said bureau, making it the duty persons in charge of mines, mining operations and quarries to make certa reports, providing for the investigation of mining operations, dealings a transactions and the prosecution for defrauding, swindling and cheating there creating a state mining bureau fund for the purpose of carrying out the provisio of this act and repealing an act entitled "An act to provide for the establishme maintenance, and support of a bureau, to be known as the state mining bure and for the appointment and duties of a board of trustees, to be known as t board of trustees of the state mining bureau, who shall have the direction, ma agement and control of said state mining bureau, and to provide for the appoi ment, duties, and compensation of a state mineralogist, who shall perform t duties of his office under the control, direction and supervision of the board trustees of the state mining bureau," approved March 23, 1893, and all ac amendatory thereof and supplemental thereto or in conflict herewith.

[Approved June 16, 1913. In effect August 10, 1913.]

[Amendment approved May 14, 1929. In effect August 14, 1929.]

The people of the State of California do enact as follows:

SECTION 1. There is hereby created and established a state mining bureau. T chief officer of such bureau shall be the state mineralogist, which office is her created.

SEC. 2. It shall be the duty of the governor of the State of California and he hereby empowered to appoint a citizen and resident of this state, having a practi and scientific knowledge of mining, to the office of state mineralogist. Said st mineralogist shall hold his office at the pleasure of the governor. He shall be a c executive officer. He shall take and subscribe the same oath of office as oth state officers. He shall receive for his services a salary of three hundred dolla ($300) per month, to be paid at the same time and in the same manner as t salaries of other state officers. He shall also receive his necessary travel expenses when traveling on the business of his office. He shall give bond for faithful performance of his duties in the sum of ten thousand dollars ($10,00 said bond to be approved by the governor of the state of California.

SEC. 3. Said state mineralogist shall employ competent geologists, field assi ants, qualified specialists and office employees when necessary in the execution of plans and operations of the bureau, and fix their compensation. The said employ shall be allowed their necessary traveling expenses when traveling on the business said department and shall hold office at the pleasure of said state mineralogist.

SEC. 4. It shall be the duty of said state mineralogist to make, facilitate, a encourage, special studies of the mineral resources and mineral industries of t state. It shall be his duty: to collect statistics concerning the occurrence and p duction of the economically important minerals and the methods pursued in mak their valuable constituents available for commercial use; to make a collection typical geological and mineralogical specimens, especially those of economic a commercial importance, such collection constituting the museum of the state min bureau; to provide a library of books, reports, drawings, bearing upon the mine industries, and sciences of mineralogy and geology, and arts of mining and met lurgy, such library constituting the library of the state mining bureau; to make collection of models, drawings and descriptions of the mechanical appliances u in mining and metallurgical processes; to preserve and so maintain such collecti and library as to make them available for reference and examination, and open public inspection at reasonable hours; to maintain, in effect, a bureau of informat

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concerning the mineral industries of this state, to consist of such collections and library, and to arrange, classify, catalogue, and index the data therein contained, in a manner to make the information availble to those desiring it; to issue from time to time such bulletins as he may deem advisable concerning the statistics and technology of the mineral industries of this state.

SEC. 5. It is hereby made the duty of the owner, lessor, lessee, agent, manager or other person in charge of each and every mine, of whatever kind or character, within the state, to forward to the state mineralogist, upon his request, at his office not later than the thirty-first day of March, in each year, a detailed report upon forms which will be furnished showing the character of the mine, the number of men then employed, the method of working such mine and the general condition thereof, the total mineral production for the past year, and such owner, lessor, lessee, agent, manager or other person in charge of any mine within the state must furnish whatever information relative to such mine as the state mineralogist may from time to time require for the proper discharge of his official duties. Any owner, lessor, lessee, agent, manager or other person in charge of each and every mine of whatever kind or character within the state, who fails to comply with the above provisions shall be deemed guilty of a misdemeanor.*

SEC. 6. The state mineralogist now performing the duties of the office of state mineralogist shall perform the duties of the office of state mineralogist as in this act provided until the appointment and qualification of his successor as in this act provided.

SEC. 7. The said state mineralogist shall take possession, charge and control of the offices now occupied and used by the board of trustees and state mineralogist and the museum, library and laboratory of the mining bureau located in San Francisco as provided for by a certain act of the legislature approved March 23, 1893, and hereafter referred to in section fourteen hereof, and shall maintain such offices, museum, library and laboratory for the purposes provided in this act.

SEC. 8. Said state mineralogist or qualified assistant shall have full power and authority at any time to enter or examine any and all mines, quarries, wells, mills, reduction works, refining works and other mineral properties or working plants in this state in order to gather data to comply with the provisions of this act.

SEC. 9. The state mineralogist shall make a biennial report to the governor on or before the fifteenth day of September next preceding the regular session of the legislature.

SEC. 10. All moneys received by the state mining bureau or any officer thereof (except such as may be paid to them by the state for disbursement) shall be receipted for by the state mineralogist or other officer authorized by him to act in his place and at least once a month accounted for by him to the state controller and paid into the state treasury to the credit of a fund which is hereby created and designated "state mining bureau fund." All moneys now in the possession of the state mining bureau or any officer thereof received from any source whatsoever, shall be immediately paid over to the state mineralogist and by him accounted for to the controller and paid into the state treasury to the credit of said fund. Said fund shall be used and is hereby appropriated for the use of said bureau in carrying out the purposes of this act.

SEC. 11. The said state mineralogist is hereby authorized and empowered to receive on behalf of this state, for the use and benefit of the state mining bureau, gifts, bequests, devises and legacies of real or other property and to use the same in accordance with the wishes of the donors, and if no instructions are given by said donors, to manage, use, and dispose of the gifts and bequests and legacies for the best interests of said state mining bureau and in such manner as he may deem proper.

SEC. 12. The state mineralogist may, whenever he deems it advisable, prepare a special collection of ores and minerals of California to be sent to or used at any world's fair or exposition in order to display the mineral wealth of the state.

SEC. 13. The state minerologist is hereby empowered to fix a price upon and to dispose of to the public, at such price, any and all publications of the state mining bureau, including reports, bulletins, maps, registers or other publications, such price shall approximate the cost of publication and distribution. Any and all sums derived from such disposition, or from gifts or bequests made, as hereinbefore provided must be accounted for by said state mineralogist and turned over to the

* Sec. 19 of the Penal Code of California provides: "Except in cases where a different punishment is prescribed by this code, every offense declared to be a misdemeanor is punishable by imprisonment in a county jail not exceeding six months, or by a fine not exceeding five hundred dollars, or by both."

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state treasurer to be credited to the mining bureau fund as provided for in section ten. He is also empowered to furnish without cost to public libraries the publications of the bureau and to exchange publications with other geological surveys and scientific societies, etc.

SEC. 14. The state mineralogist provided for by this act shall be the successor in interest of the board of trustees of the state mining bureau, and the state mineralogist, under and by virtue of that certain act, entitled "An act to provide for the establishment, maintenance, and support of a bureau, to be known as the state mining bureau, and for the appointment and duties of a board of trustees, to be known as the board of trustees of the state mining bureau, who shall have the direction, management, and control of said state mining bureau, and to provide for the appointment, duties, and compensation of a state mineralogist, who shall perform the duties of his office under the control, direction and supervision of the board of trustees of the state mining bureau," approved March 23, 1893, and all books, papers, documents, personal property, records, and property of every kind and description obtained or possessed, or held or controlled by the said board of trustees of the said state mining bureau, and the state mineralogist, and the clerks and employees thereof, under the provisions of said act of March 23, 1893, or any act supplemental thereto or amendatory thereof, shall immediately be turned over and delivered to the said state mineralogist herein provided for, who shall have charge and control thereof.

SEC. 15. That certain act entitled "An act to provide for the establishment, maintenance, and support of a bureau, to be known as the state mining bureau, and for the appointment and duties of a board of trustees, to be known as the board of trustees of the state mining bureau, and to provide for the appointment, duties and compensation of a state mineralogist, who shall perform the duties of his office under the control, direction, and supervision of the board of trustees of the state mining bureau," approved March 23, 1893, together with all acts amendatory thereof and supplemental thereto and all acts in conflict herewith are hereby repealed.

SEC. 16. For the purpose of this act and as used herein the term "mine" is hereby defined to embrace and include all mineral bearing properties of whatever kind or character whether underground, quarry, pit, well, spring or other source from which any mineral substance is or may be obtained, and the term "mineral" for the purposes of this act and whenever so used shall embrace and include any and all mineral products both metallic and nonmetallic, solid, liquid or gaseous, and mineral waters of whatever kind or character.

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DEPARTMENT OF NATURAL RESOURCES ACT

Chap. 128 [Stats. 1927]; amended, Chap. 307 [Stats. 1929.]

An act to add a new article to chapter three of title one of part three of the Political Code to be numbered article two j, embracing sections three hundred seventy-three to three hundred seventy-three i, relating to a department of natural resources.

[Approved by the Governor April 13, 1927.]

[Amendment approved May 18, 1929.]

The people of the State of California do enact as follows:

SECTION 1. The Political Code is hereby amended by adding a new article to chapter III of title I of part III thereof, to be numbered article II*f*, embracing sections 373 to 373*i* and to read as follows:

ARTICLE II*j*.

DEPARTMENT OF NATURAL RESOURCES.

373. A department of the government of the State of California to be known as the department of natural resources is hereby created. The department shall be conducted under the control of an executive officer to be known as the director of natural resources, which office is hereby created. The director shall be appointed by and hold office at the pleasure of the governor and shall receive a salary of six thousand dollars per annum.

Except as in this article otherwise provided, the provisions of article II of this chapter, title, and part of the Political Code as adopted at the forty-fourth session of the Legislature and as the same may be amended from time to time, shall govern and apply to the conduct of the department of natural resources in every respect the same as if such provisions were herein set forth at length and wherever in said article II the term "head of the department" or similar designation occurs, the same shall for the purposes of this article mean the director of natural resources.

373*a*. For purposes of administration the department shall be forthwith organized by the director thereof, subject to the approval of the governor, in such manner as he shall deem necessary to properly segregate and conduct the work of the department, and the director shall have power to appoint, in accordance with the civil service and other provisions of law, such deputies, officers and other expert and clerical assistants as may be necessary. The work of the department is hereby divided into at least four divisions to be known as the division of forestry, the division of parks, the division of fish and game, and the division of mines.

373*b*. The division of mines shall be administered through a chief who shall be appointed by the director of natural resources upon the nomination of the state mining board, the chief to be a technically trained mining engineer and to be known as the state mineralogist; such chief shall receive a salary of six thousand dollars per annum. General policies for the guidance of the division of mines shall be determined by a board to be known as the state mining board, which shall consist of five members appointed by and to hold office at the pleasure of the governor.

373*c*. The division of forestry shall be administered through a chief of division who shall be known as the state forester, who shall be a technically trained forester, appointed by the director of natural resources upon nomination by the state board of forestry hereinafter provided. General policies for the guidance of the division of forestry shall be determined by a state board of forestry which shall consist of seven members appointed by and holding office at the pleasure of the governor. Of the seven members one shall be familiar with the pine timber industry, one with the redwood industry, one with the live stock industry, one with general agriculture and one with the problems of water conservation.

373*d*. The division of parks shall be administered through a chief of division who shall be appointed by the director of natural resources upon nomination by the state park commission hereinafter provided. General policies for the administration of the state park system shall be determined by the state park commission

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which is hereby created to consist of five members appointed by the governor and holding office at his pleasure.

373*e*. The division of fish and game shall be administered through a fish and game commission consisting of three members appointed by and holding office at the pleasure of the governor.

373*f*. The chiefs of the divisions of forestry and parks respectively shall receive such salaries as may be determined by the director with the approval of the governor. The director of natural resources and the chief of each division before entering upon his duties shall execute to the State of California an official bond in the penal sum of twenty-five thousand dollars conditioned upon the faithful performance of his duties. The members of the board of forestry, the state parks commission and fish and game commission shall serve without compensation, but shall be entitled to their actual expenses incurred in the performance of their duties.

373*g*. The department of natural resources shall succeed to and is hereby invested with all the duties, powers, purposes, responsibilities and jurisdiction of the state mining bureau, state mineralogist, department of petroleum and gas, state oil and gas supervisor, state forester, state board of forestry, California redwood park commission, San Pasqual battlefield commission, Mount Diablo park commission, state fish and game commission, state fish and game commissioners, and, except as herein otherwisee provided, of the several officers, deputies and employees of such bodies and offices, and whenever by the provisions of any statute or law now in force or that may hereafter be enacted a duty or jurisdiction is imposed or authority conferred upon any of said officers, offices, bodies, deputies or employees by any statute the enforcement of which is transferred to the department, such duty, jurisdiction and authority are hereby imposed upon and transferred to the department of natural resources and the appropriate officers thereof with the same force and effect as though the title of said department of natural resources had been specifically set forth and named therein in lieu of the name of any such body, office, officer, deputy or employee. Said bodies and offices, the duties, powers, purposes, responsibilities and jurisdiction of which are so transferred and vested in the department of natural resources, and the positions of all officers, deputies and employees thereunder are and each of them is hereby abolished and shall have no further legal existence but the statutes and laws under which they existed and all laws prescribing their duties, powers, purposes, responsibilities and jurisdiction, together with all lawful rules and regulations established thereunder are hereby expressly continued in force.

The department of natural resources shall be in possession and control of all records, books, papers, offices, equipment, supplies, moneys, funds, appropriations, land and other property real or personal now or hereafter held for the benefit or use of said bodies, offices and officers.

The boards of district oil and gas commissioners, the offices of district oil and gas commissioners and the board of review, correction and equalization created by the act approved June 10, 1915, establishing the department of petroleum and gas, are hereby respectively continued in force with the powers, duties, responsibilities and jurisdiction in them vested by the provisions of said act approved June 10, 1915, as amended; *provided*, that said board of review shall consist of the director of natural resources, the director of finance and the chairman of the state board of equalization.

373*h*. The management and control of the property acquired by the State of California under or pursuant to the provisions of the act entitled "An act to accept the gift to the state of San Pasqual battlefield in San Diego county, to provide for collecting and systematizing the history of said battle, for determining the exact location thereof, and to report a suitable method of marking said battlefield and commemorating the heroism of those Americans who fought and died there," approved May 11, 1919, is hereby transferred to and vested in the department of natural resources.

373*i*. From and after the date upon which this act takes effect, the department of natural resources shall be and is hereby authorized and empowered to expend the moneys in any appropriation or in any special fund in the state treasury now remaining or made available by law for the administration of the provisions of all the statutes the administration of which is committed to the department, or for the use, support, or maintenance of any board, bureau, commission, department, office or officer whose duties, powers, and functions are, by the provisions of this article, transferred to and conferred upon the department of natural resources. Such expenditures by the department shall be made in accordance with law in carrying out the purposes for which such appropriations were made or such special funds created.

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PUBLICATIONS OF THE DIVISION OF MINES

During the past fifty-one years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the State, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the office of the Division of Mines, in the Ferry Building, San Francisco; Bankers Building, Los Angeles; State Office Building, Sacramento; Redding; Santa Maria; Santa Paula; Coalinga; Taft; Bakersfield. They may also be found in many public, private and technical libraries in California and other states, and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained by addressing any of the above offices and enclosing the requisite amount in the case of publications that have a list price. Only coin, stamps or money orders should be sent, and it will be appreciated if remittance is made in this manner rather than by personal check.

The prices noted include delivery charges to all parts of the United States. Money orders should be made payable to the Division of Mines.

NOTE.—The Division of Mines frequently receives requests for some of the early reports and bulletins now out of print, and it will be appreciated if parties having such publications and wishing to dispose of them will advise this office.

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REPORTS

Asterisks (**) indicate the publication is out of print.

**First Annual Report of the State Mineralogist, 1880, 43 pp. Henry G. Hanks
**Second Annual Report of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks
**Third Annual Report of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks
**Fourth Annual Report of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks
**Fifth Annual Report of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks
**Sixth Annual Report of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks
**Part II, 1887, 222 pp., 36 illustrations. William Irelan, Jr.
**Seventh Annual Report of the State Mineralogist, 1887, 315 pp. William Irelan, Jr.
**Eighth Annual Report of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Irelan, Jr.
**Ninth Annual Report of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Irelan, Jr.
**Tenth Annual Report of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Irelan, Jr.
Eleventh Report (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Irelan, Jr.
**Twelfth Report (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford
**Thirteenth Report (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford
Chapters of the State Mineralogist's Report, Biennial Period, 1913–1914, Fletcher Hamilton:
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**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper
**Fourteenth Report of the State Mineralogist, for the Biennial Period 1913–1914, Fletcher Hamilton, 1915:
A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou and Trinity Counties, 974 pp., 275 illustrations, cloth
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Seventeenth Report of the State Mineralogist, 1920, 'Mining in California during 1920,' Fletcher Hamilton; 562 pp., 71 illustrations, cloth	1.75
Eighteenth Report of the State Mineralogist, 1922, 'Mining in California,' Fletcher Hamilton. Chapters published monthly beginning with January, 1922:	
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**Bulletin No. 56. Mineral Production for 1908, with County Maps and Mining Laws of California, by D. H. Walker. 78 pp.----
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**Bulletin No. 66. Mining Laws of the United States and California. 1914. 89 pp.----
**Bulletin No. 67. Minerals of California, by Arthur S. Eakle. 1914. 226 pp. (See Bulletin 91)----
**Bulletin No. 68. Mineral Production for 1913, with County Maps and Mining Laws, by E. S. Boalich. 160 pp.----

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**Bulletin No. 100. California Mineral Production for 1926, by Walter W. Bradley. 1927, 174 pp., paper .....

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**First Annual Catalogue of the State Museum of California, being the collection made by the State Mining Bureau during the year ending April 16, 1881. 350 pp. .....

**Catalogue of books, maps, lithographs, photographs, etc., in the library of the State Mining Bureau at San Francisco, May 15, 1884. 19 pp. .....

**Catalogue of the State Museum of California, Volume II, being the collection made by the State Mining Bureau from April 16, 1881, to May 5, 1884. 220 pp. .....

**Catalogue of the State Museum of California, Volume III, being the collection made by the State Mining Bureau from May 15, 1884, to March 31, 1887. 195 pp. .....

**Catalogue of the State Museum of California, Volume IV, being the collection made by the State Mining Bureau from March 30, 1887, to August 20, 1890. 261 pp. .....

**Catalogue of the Library of the California State Mining Bureau, September 1, 1892. 149 pp. .....

**Catalogue of West North American and Many Foreign Shells with Their Geographical Ranges, by J. G. Cooper. Printed for the State Mining Bureau, April, 1894 .....

**Report of the Board of Trustees for the four years ending September, 1900. 15 pp. Paper. .....

Bulletin. Reconnaissance of the Colorado Desert Mining District. By Stephen Bowers, 1901. 19 pp. 2 illustrations. Paper. ..... Free

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Register of Mines, with Map, Yuba County (1905)	.25
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OTHER MAPS

**Map of California, Showing Mineral Deposits (50 x 60 in.)	----
**Map of Forest Reserves in California	----
**Mineral and Relief Map of California	----
**Map of El Dorado County, Showing Boundaries, National Forests	----
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**Map of California accompanying Bulletin No. 89, showing generalized classification of land with regard to oil possibilities. Map only, without Bulletin	----
Geological Map of California, 1916. Scale 1 inch equals 12 miles. As accurate and up-to-date as available data will permit as regards topography and geography. Shows railroads, highways, post offices and other towns. First geological map that has been available since 1892, and shows geology of entire State as no other map does. Geological details lithographed in 23 colors. Unmounted	.75
Mounted	2.00
Topographic Map of Sierra Nevada Gold Belt, showing distribution of auriferous gravels, accompanying Bulletin No. 92 (also sold singly) In 4 colors	.50

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OIL FIELD MAPS

These maps are revised from time to time as development work advances and ownerships change.

	Price
Map No. 1—Sargent, Santa Clara County	$0.50
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Map No. 3—Santa Maria, including Casmalia and Lompoc	.75
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Map No. 5—Whittier-Fullerton, including Whittier, West Coyote and Montebello	.75
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Map No. 8—South Midway and Buena Vista Hills, Kern County	.75
Map No. 9—North Midway and McKittrick, Kern County	.75
Map No. 10—Belridge and McKittrick, Kern County	.75
Map No. 11—Lost Hills and North Belridge, Kern County	.75
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Map No. 17—Santa Paula-Sespe Oil Fields, Ventura County	.75
Map No. 18—Piru-Simi-Newhall Oil Fields	.75
Map No. 19—Arroyo Grande, San Luis Obispo County	.75
Map No. 20—Long Beach Oil Field	1.25
Map No. 21—Portion of District 4, Showing Boundaries of Oil Fields, Kern and Kings counties	.75
Map No. 21A—Portion Kern and Kings counties	.75
Map No. 22—Portion of District 3, Showing Oil Fields, Santa Barbara County	.75
Map No. 23—Portion of District 2, Showing Boundaries of Oil Fields, Ventura County	.75
Map No. 24—Portion of District 1, Showing Boundaries of Oil Fields, Los Angeles and Orange counties	.75
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Map No. 27—Santa Fe Springs Oil Field	.75
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Map No. 29—Dominguez, Los Angeles County	.75
Map No. 30—Rosecrans, Los Angeles County	.75
Map No. 31—Inglewood, Los Angeles County	.75
Map No. 32—Seal Beach, Los Angeles and Orange counties	.75
Map No. 33—Rincon, Ventura County	.75
Map No. 34—Mt. Poso, Kern County	.75
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Map No. 41—Potrero, Los Angeles County	.75
Map No. 42—Playa Del Rey, Los Angeles County	.75

DETERMINATION OF MINERAL SAMPLES

Samples (limited to three at one time) of any mineral found in the State may be sent to the Division of Mines for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the State. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

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